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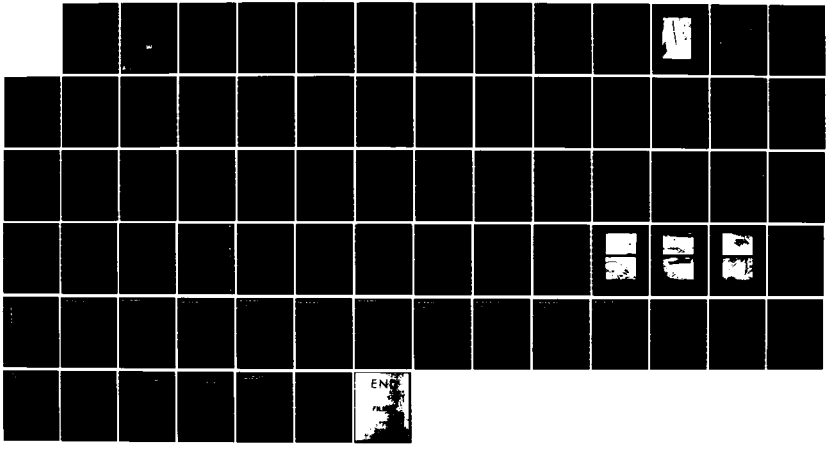

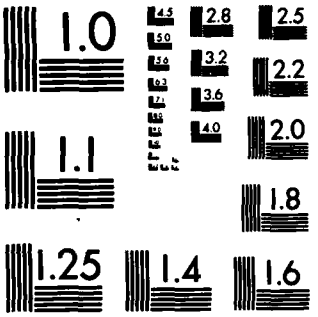

MICROCOPY RESOLUTION TEST CHART
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CONNECTICUT RIVER BASIN

MIDDLETOWN, CONNECTICUT

DOOLEY POND DAM
CT 00142

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Dooley Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE August 1980 13. NUMBER OF PAGES 55
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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Conn. River Basin
Middletwon, Conn.
Dooley Pond Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The project has a total length of approx. 320 ft., consisting of a 300 ft. long embankment and a 20 ft. long concrete spillway. The dam is approx. 23.5 ft. in height. The project is judged to be in fair condition. Its classified as a high hazard, small size dam. The test flood range to be considered is from one-half to full probable maximum flood.

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BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

NAME OF DAM:	DOOLEY POND DAM
INVENTORY NUMBER:	00142
STATE:	CONNECTICUT
COUNTY:	MIDDLESEX
TOWN:	MIDDLETOWN
STREAM:	LONG HILL BROOK
OWNER:	STATE OF CONNECTICUT
DATE OF INSPECTION:	APRIL 21, 1980
INSPECTION TEAM:	PETER HEYNEN, P.E.
	HECTOR MORENO, P.E.
	MIRON PETROVSKY
	THEODORE STEVENS
	ROBERT JAHN

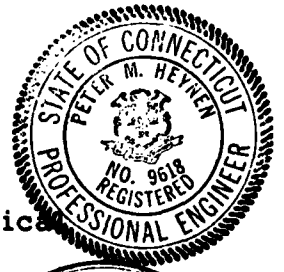
The project, substantially reconstructed in 1967, has a total length of approximately 320 feet, consisting of an approximately 300 foot long embankment and a 20 foot long concrete spillway. The dam is approximately 23.5 feet in height above the streambed of Long Hill Brook and, with the pond level to the top of the dam, impounds approximately 250 acre-feet of water. The upstream slope is protected to the top of the dam by dumped rock riprap. The spillway is a concrete chute and is located near the right end of the dam. The low-level outlet facility is a 24 inch reinforced concrete pipe at the central portion of the embankment and is controlled from a concrete gatehouse on the top of the dam. Right and left toe drains run the entire length of the embankment and discharge from the centrally located low-level outlet headwall (See Sheet B-1).

Based upon the visual inspection and past performance, the project is judged to be in fair condition. No evidence of instability of the embankment or spillway was observed. However, there are items which require monitoring and/or maintenance, such as erosion of the spillway discharge channel and a stagnant water condition in the low-level outlet channel which does not allow a free flow of water from the toe drain pipes.

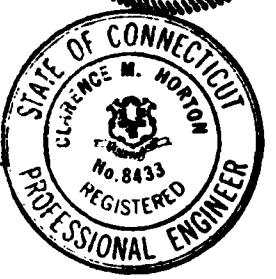
In accordance with the Army Corps of Engineers' Guidelines, Dooley Pond Dam is classified as a high hazard, small size dam. The test flood range to be considered is from one-half to full Probable Maximum Flood (PMF). The test flood for Dooley Pond Dam is equivalent to the 1/2 PMF. Peak inflow to the reservoir at the 1/2 PMF is 850 cubic feet per second (cfs); peak outflow is 580 cfs with the lowest point along the top of the dam overtopped by 0.4 feet. The spillway capacity, with the reservoir level to the low point of the top of the dam, is 380 cfs, which is equivalent to 66% of the routed test flood outflow.

It is recommended that the owner retain the services of a registered professional engineer to perform a more detailed hydraulic analysis to determine the adequacy of the project discharge, to evaluate the condition of the toe drains and to formulate recommendations concerning the erosion of the spillway discharge channel. Any recommendations made by the engineer should be implemented by the owner.

The above recommendations and further remedial measures presented in Section 7 should be instituted within one year of the owner's receipt of this report.



Peter M. Heynen, P.E.
Project Manager - Geotechnical
Cahn Engineers, Inc.



C. Michael Horton, P.E.
Department Head
Cahn Engineers, Inc.

This Phase I Inspection Report on Dooley Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, Member
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, Member
Design Branch
Engineering Division

RICHARD DIBOONO, Chairman
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions there of. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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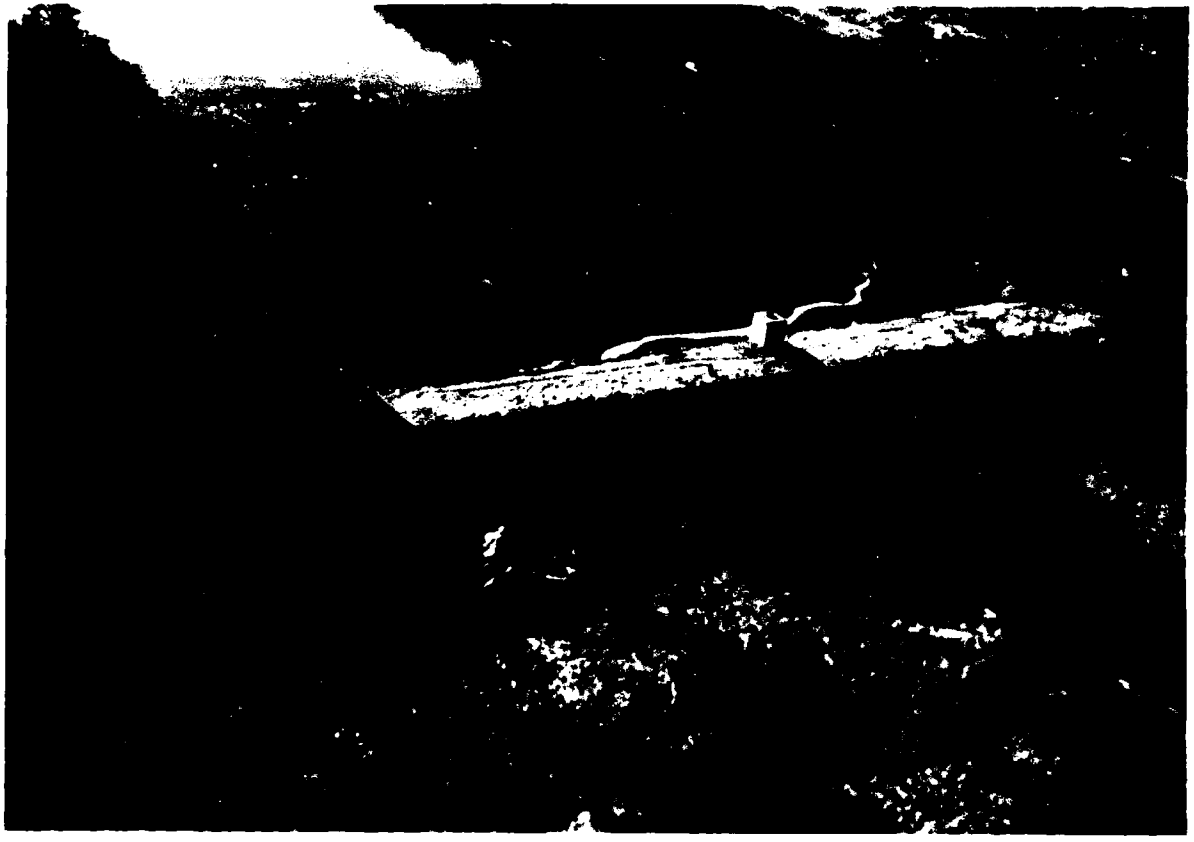
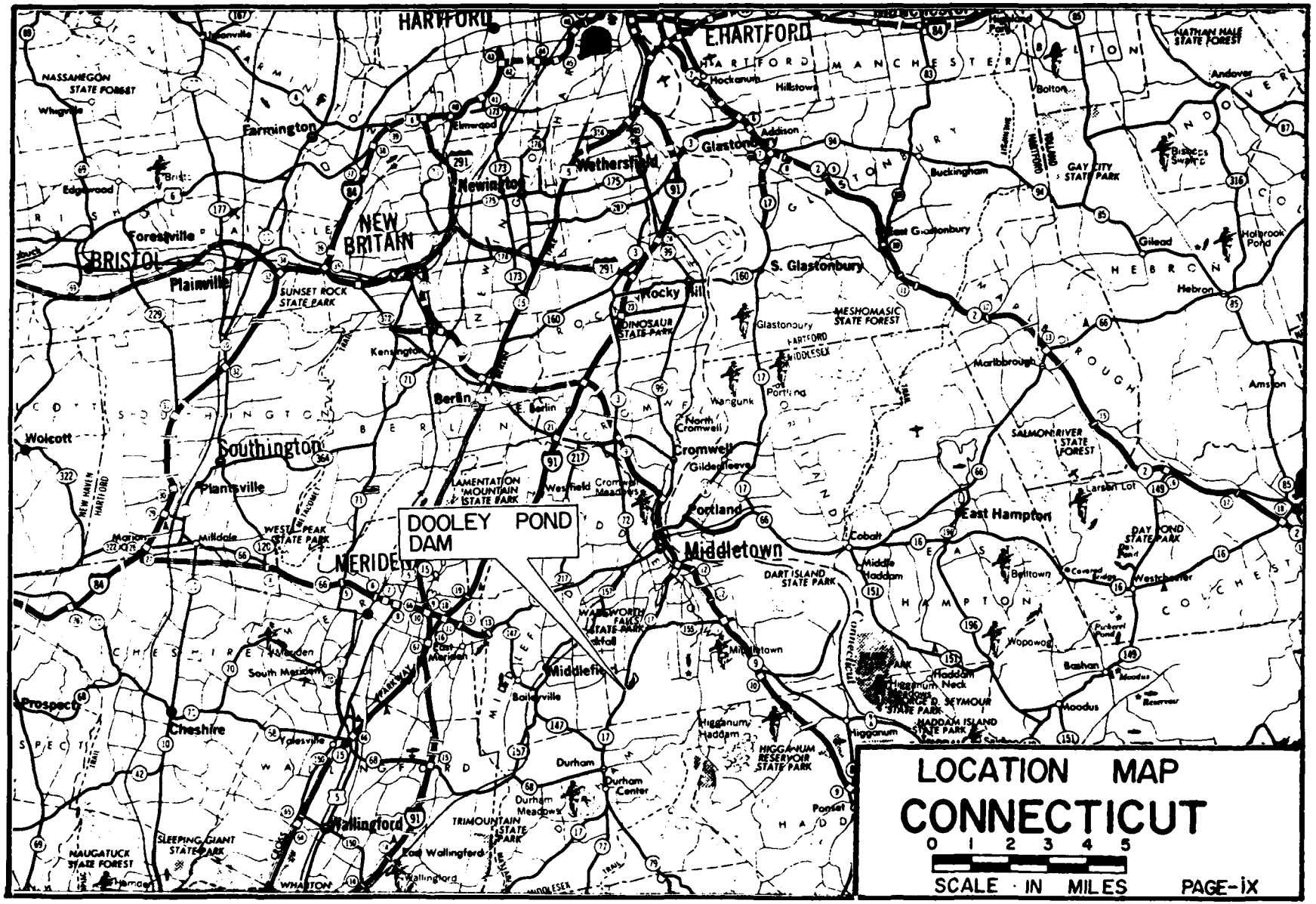
APPENDICES



OVERVIEW PHOTO
(February, 1980)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Dooley Pond Dam	Middletown	DATE May, 1980
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED DAMS	Long Hill Brook	CONNECTICUT	CE #27 785 KA PAGE viii


DOOLEY POND DAM
HARTFORD
E.HARTFORD
NEW BRITAIN
BRISTOL
Plainville
Farmington
Newington
Wethersfield
Glastonbury
S. Glastonbury
Rocky Hill
Berlin
Southington
Plantsville
Wolcott
MERIDEN
Middletown
Portland
East Hampton
Cromwell
Prospect
Cheshire
Wallingford
Durham
Middlefield
Haddam
Marlborough
Hebron
Gilead
Colchester
SUNSET ROCK STATE PARK
DINOSAUR STATE PARK
MESHOMASIC STATE FOREST
LAMENTATION MOUNTAIN STATE PARK
WEST PEAK STATE PARK
DART ISLAND STATE PARK
WADSWORTH FALLS STATE PARK
HIGGANUM RESERVOIR STATE PARK
GAY CITY STATE PARK
SALMON RIVER STATE FOREST
DAY POND STATE PARK
TRIMOUNTAIN STATE PARK
SLEEPING GIANT STATE PARK
NAUGATUCK STATE FOREST
NASSAMEGON STATE FOREST
NATHAN HALE STATE FOREST
LOCATION MAP
CONNECTICUT
0 1 2 3 4 5
SCALE IN MILES

PHASE I INSPECTION REPORT

DOOLEY POND DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of April 14, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0052 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgement on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on Long Hill Brook in a rural area of the City of Middletown, County of Middlesex, State of Connecticut. The dam is shown on the Middletown USGS Quadrangle Map having coordinates latitude N41°30.9' and longitude W72°40.1'.

b. Description of Dam and Appurtenances - As shown on sheet B-1, the dam is 23.5 feet in height and 320 feet in length, including a 20 foot long concrete spillway near the right end of the dam and a low-level outlet at the central portion of the dam.

The grass covered embankment has a top width of 20 feet and a designed top elevation of 252.5 (assumed NGVD datum - See Sheet B-1), which is 3.5 feet above the spillway crest. Upstream and downstream slope inclinations are 2 horizontal to 1 vertical. The upstream slope is protected by dumped trap rock riprap to the top of the dam. Right and left toe drains, along the length of the dam, each consist of a 4 foot deep sand fill with an 18 inch crushed stone layer surrounding a 6 inch perforated pipe. The toe drains discharge at the downstream headwall of the low-level outlet.

The 20 foot long spillway, with a crest elevation of 249.0 is a broad-crested concrete chute which turns to the left on a radius of 80 feet. The floor of the chute is constructed of 8 inch thick reinforced concrete slabs founded on a 1 foot thick layer of compacted gravel fill. The spillway training walls are also constructed of 8 inch thick reinforced concrete. The spillway approach channel has a dumped riprap bottom and drops off rather steeply from the spillway crest. The spillway chute discharges, at elevation 238.0, into a partially riprap lined channel leading to the natural streambed of Long Hill Brook.

The low-level outlet for the dam is a 24 inch diameter reinforced concrete pipe with intake at invert elevation 232.0 and outlet at invert elevation 230.0. There are concrete headwalls at both the intake and outlet with a trashrack at the intake and a protective bar cage at the outlet. The operating works consist of an unseating pressure gate controlled by a manually operated gear pedestal in a concrete gatehouse on the top of the dam.

c. Size Classification - (SMALL) - The dam impounds approximately 250 acre-feet of water with the lake level to the top of the dam, which is approximately 23.5 feet above the streambed of Long Hill Brook. According to the Army Corps of Engineers' Recommended Guidelines, a dam with maximum storage between 50 and 1000 acre-feet is classified as small in size.

d. Hazard Classification - (HIGH) - If the dam were breached, there is potential for loss of more than a few lives and extensive property damage to three or more houses, a school, an apartment building and two restaurants located approximately 3500 feet downstream of the dam (See Sheet D-1 and Page D-6). A breach of the dam would cause these structures to be inundated to a depth of approximately 4.5 feet.

e. Ownership - State of Connecticut
Dept of Environmental Protection
Div. of Conservation and Preservation
Region 3 Headquarters
R.R. 2, Box 150A
East Hampton, CT 06420
(203) 295-9523
Mr. John Spencer
Mr. Charles Phillips

f. Operator - Mr. Donald Berry
Unit Manager
Cockaponsett State Forest
(203) 345-4449

g. Purpose of Dam - Recreational. The pond is used mainly for fishing.

h. Design and Construction History - Nothing is known of the original dam construction; however, the dam was extensively repaired in 1967 according to drawings dated April 15, 1966 by A.J. Macchi Engineers. The 1967 work included construction of the present spillway, low-level outlet works and toe drain, as well as addition of material to the upstream and downstream slopes, regrading of the embankment and placement of riprap. The drawings were reviewed and the work inspected and approved by the State of Connecticut Water Resources Commission.

i. Normal Operational Procedures - There are no operational procedures followed at the dam. The low-level outlet gate is kept in a closed position.

1.3 PERTINENT DATA

a. Drainage Area - The drainage area is 0.67 square miles of relatively sparsely developed rolling woodland and meadowland.

b. Discharge at Damsite - Discharge is over the spillway and through the 24 inch diameter low-level outlet.

1. Outlet Works (Conduits):	
24 inch low-level outlet @ invert el. 232.0:	60 cfs (pond level to top of dam)
2. Maximum flood at damsite:	Not known
3. Ungated spillway capacity @ top of dam (low point) el. 252.2:	380 cfs
4. Ungated spillway capacity @ test flood el. 252.6:	450 cfs

5. Gated spillway capacity @ normal pool:	N/A
6. Gated spillway capacity @ test flood:	N/A
7. Total spillway capacity @ test flood el. 252.6:	450 cfs
8. Total project discharge @ top of dam el. 252.2:	440 cfs
9. Total project discharge @ test flood el. 252.6:	580 cfs

c. Elevations - (National Geodetic Vertical Datum based on assumed spillway crest elevation of 249.0 taken from Middletown USGS Quadrangle Map, 1972).

1. Streambed @ toe of dam:	229.0±
2. Bottom of cutoff:	N/A
3. Maximum tailwater:	Not known
4. Normal pool:	249.0±
5. Full flood control pool:	N/A
6. Spillway crest (ungated):	249.0 (Assumed datum)
7. Design surcharge (original design):	Not known
8. Top of dam:	252.2±
9. Test flood surcharge:	252.6

d. Reservoir Length

1. Normal pool:	2,000± ft.
2. Flood control pool:	N/A
3. Spillway crest pool:	2,000± ft.
4. Top of dam pool:	2,500± ft.
5. Test flood pool:	2,500± ft.

e. Reservoir Storage

1. Normal pool:	160± acre-ft.
2. Flood control pool:	N/A

3. Spillway crest pool:	160± acre-ft.
4. Top of dam pool:	250± acre-ft.
5. Test flood pool:	260± acre-ft.
f. Reservoir Surface	
1. Normal pool:	28 acres
2. Flood control pool:	N/A
3. Spillway crest pool:	28 acres
4. Top of dam pool:	31 acres
5. Test flood pool:	31 acres
g. Dam	
1. Type:	Earth embankment
2. Length:	320 ft.
3. Height:	23.5 ft.
4. Top width:	20 ft.
5. Side slopes:	2H to 1V (Upstream and Downstream)
6. Zoning:	Original dam composition not known. Impervious soils added on upstream slope; pervious soils added on downstream slope.
7. Impervious core:	N/A
8. Cutoff:	N/A
9. Grout curtain:	N/A
10. Other:	Toe drains
h. Diversion and Regulating Tunnel - N/A	
i. Spillway	
1. Type:	Concrete chute
2. Length of weir:	20 ft.
3. Crest elevation:	249.0 (Assumed datum)

4. Gates:	N/A
5. Upstream channel:	+2H to 1V - Dumped riprap bottom
6. Downstream channel:	Partially riprap lined channel
7. General:	Chute curves to left on radius of 80' and has average slope of 6.7 to 1.

j. Regulating Outlets

Low-Level Outlet

1. Invert:	232.0 (Intake) 230.0 (Outlet)
2. Size:	24 inch dia.
3. Description:	Reinforced concrete pipe
4. Control mechanism:	Unseating pressure gate, Manually operated gear pedestal.
5. Other:	Trashrack at intake, bar cage at outlet

SECTION 2: ENGINEERING DATA

2.1 DESIGN DATA

The available data consists of drawings for repairs to the dam by A.J. Macchi Engineers, inventory data by the State of Connecticut, a bathymetric map of the pond, and various inspection reports (See Appendix B).

The drawings for the dam's repair indicate the design features stated previously in this report.

2.2 CONSTRUCTION DATA

The 1967 repairs were inspected and approved by the State of Connecticut Water Resources Commission (See pages B-9 and B-19).

2.3 OPERATIONS DATA

Lake level readings are not taken and no formal operations records are known to exist. It is not known if the dam has ever been overtopped.

2.4 EVALUATION OF DATA

a. Availability - Existing data was provided by the State of Connecticut.

b. Adequacy - The engineering data available was generally inadequate to perform an in-depth assessment of the dam; therefore, the final assessment of this dam must be based primarily on visual inspection, performance history, hydraulic computations of spillway capacity and hydrologic estimates.

c. Validity - A comparison of record data and visual observations reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The general condition of the project is fair. The inspection revealed several areas requiring maintenance and monitoring. At the time of the inspection, the reservoir level was at elevation 249.1, i.e. 0.1 foot above spillway crest.

b. Dam

Top of Dam - The top of the dam is covered by grass and clear from tall vegetation except for the short section of the embankment located to the right of the spillway, which is covered by a heavy growth of brush and saplings (Photo 1).

Upstream Slope - Displacement of riprap has occurred at many areas along the slope, leaving exposed earth zones, which are slightly eroded. Some brush was noted on the slope (Photos 1 & 2).

Downstream Slope - The downstream slope is covered by grass except for a minor amount of brush and small trees. In general, the slope is uniform; however, moist soils and a depression were observed in an area at the right side of the embankment. The ground at the toe of the dam is wet and soggy, especially near the left abutment of the embankment (Photo 3).

Spillway - The concrete of the spillway weir and chute is in good condition. There are a number of vertical cracks with openings of up to ¼ inch on both spillway training walls. The cracks usually are located at the wall corners and construction joints. Rocks and logs were observed on the spillway weir and at the end of the chute floor (Photos 4 & 5). Both the bottom and right bank of the spillway discharge channel are severely eroded adjacent to the concrete spillway chute. Riprap, shown on design drawings, is missing, having apparently been eroded away. The deepest erosion of the channel bottom, approximately 3.5 to 4 feet deep, is at a distance of 10 feet from the end of the chute (Photo 5). Erosion of the right channel bank extends into the bank approximately 15 to 20 feet from the channel water line and has a maximum depth of 8 to 10 feet (Photo 4). The steeply eroded bank is saturated and many seeps, with a total flow of 6 to 8 gallons per minute (gpm), are emanating from it. This seepage flow is probably mainly from the adjacent hillside and only partially from the embankment. An accumulation of rocks and logs mark the downstream end of the channel bottom erosion and causes ponding of water at the bottom of the spillway chute (Photos 4 & 5).

c. Appurtenant Structures - The concrete of the 24 inch low-level outlet headwall is in good condition. Both 6 inch concrete drain pipe outlets, located on the right and left wing walls, were flowing with a total rate of 3 to 4 gpm, with most of the flow from the right drain pipe. The floor of the low-level outlet is covered by 3 inch thick brown silt deposit and small stones (Photo 6). Stagnant, or nearly stagnant, water was observed in the outlet discharge channel. The cause of this condition may be the very gentle grade of the channel bottom.

The operating facilities were not available for inspection.

d. Reservoir Area - The area surrounding the pond is generally wooded and partially developed. State Route 17 runs along the left side of the pond.

e. Downstream Channel - The downstream channel is the natural streambed of Long Hill Brook. It is moderately developed, swampy, and wooded to the initial impact area.

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being in fair condition. The following features which could influence the future condition and/or stability of the project were identified:

1. Erosion of the upstream slope can occur, due to the displacement of riprap protection and the exposed areas of the slope.

2. Erosion of the bottom and bank of the spillway discharge channel adjacent to the spillway could cause instability of the channel bank and undermining of the spillway.

3. The relatively small amount of seepage entering the embankment drainage system may be an indication of siltation of the drainpipes. Further evidence of this is the existence of wet areas at the toe of the embankment.

4. The low-level outlet channel which does not freely discharge to the spillway channel can cause sedimentation and vegetation overgrowth of the outlet channel and saturation of the toe of the embankment.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General - Lake level readings are not taken and the low-level outlet is not exercised. The persons we contacted did not know if or where there is a key to the locked gatehouse.

b. Description of Any Warning System in Effect - During and after periods of extremely heavy precipitation and/or high streamflows, representatives of the Connecticut Department of Environmental Protection check the condition of the dam. If they were to detect a problem, Middletown civil preparedness authorities would be notified.

4.2 MAINTENANCE PROCEDURES

a. General - The only maintenance performed on the dam is the yearly cutting of brush.

b. Operating Facilities - The operating facilities are not exercised or maintained.

4.3 EVALUATION

The operation and maintenance procedures should be expanded. A formal program of operation and maintenance should be implemented, including documentation to provide records for future reference. Remedial operation and maintenance recommendations are presented in Section 7.3.

SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The watershed is 0.67 square miles of rolling, wooded terrain. The dam impoundment is presently used for recreational purposes.

The Dooley Pond Dam is an earth embankment, which includes a concrete spillway. The dam is basically a low surcharge storage - high spillage type project. The available storage reduces the outflow from a Probable Maximum Flood (PMF) of 1750 cubic feet per second (cfs) to 1450 cfs and the ½ PMF outflow from 850 cfs to 580 cfs.

5.2 DESIGN DATA

No computations could be found for the original design of the dam or for the 1967 repairs.

5.3 EXPERIENCE DATA

Reportedly, the dam withstood the hurricane flood of 1938 with only minor damages (B-3). No other information is available.

5.4 VISUAL OBSERVATIONS

It was noted that first overflow of the embankment would occur at elevation 252.2, rather than its designed top elevation of 252.5.

5.5 TEST FLOOD ANALYSIS

Based upon the U.S. Army Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges" dated March, 1978, the watershed classification (Rolling) and the watershed area of 0.67 square miles, a PMF of 1700 cfs or 2500 cfs per square mile is estimated at the damsite. In accordance with the size (small) and hazard (high) classification, the range of test floods to be considered is from the ½ PMF to the PMF. Based on the degree of hazard associated with a breach of the dam, the test flood for Dooley Pond Dam is equivalent to the ½ PMF. Assuming the pond level at the spillway crest at the beginning of the test flood, peak inflow is 850 cfs; peak outflow is estimated at 580 cfs and this flow will overtop the low point of the dam by 0.4 feet (Appendix D-2 & D-5). Based on hydraulics computations, the spillway capacity to the top of the dam is 380 cfs, which is equivalent to 66% of the routed test flood outflow.

5.6 DAM FAILURE ANALYSIS

The dam failure analysis is based on the April, 1978 Army Corps of Engineers "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs". Peak outflow before failure of the dam would

be about 430 cfs and the peak failure outflow from the dam breaching would total about 20,000 cfs. A breach of the dam would result in a rise in the water level of the stream at the initial impact area, from a depth of 2.8 feet just before the breach to a depth of about 9.5 feet shortly after the breach. This rapid, 6.7 foot increase in the water level will inundate some 3 or more houses, a school, an apartment building and 2 restaurants by up to 4.5 feet, causing severe economic loss and the loss of more than a few lives. (Appendix D-6). Based on the dam failure analysis, Dooley Pond dam is classified as a high hazard dam.

SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS

The visual inspection did not reveal any indications of immediate stability problems. There are areas of erosion and seepage, as described in Section 3; however, they are not considered to be stability concerns at the present time.

6.2 DESIGN AND CONSTRUCTION DATA

The available drawings and data, which are included in Appendix B are not sufficient to perform an in-depth analysis of the dam. No engineering assumptions, data or calculations could be found for the original design of the dam or for the 1967 repairs.

6.3 POST-CONSTRUCTION CHANGES

In 1957, the upstream and downstream slopes were broadened to 2 horizontal to 1 vertical inclinations from somewhat steeper, more irregular slopes and an upstream stone retaining wall was removed. As shown on drawings by A.J. Macchi Engineers dated April 15, 1966, impervious soil was added on the upstream slope and a pervious fill was added on the downstream slope. New low-level outlet facilities, a new spillway, and toe drains were also constructed at that time. These repairs represent a significant improvement in the stability of the dam.

6.4 SEISMIC STABILITY

The dam is in seismic Zone 1 and according to Army Corps of Engineers Recommended Guidelines, need not be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Project Assessment

a. Condition - Based upon the visual inspection of the site and past performance, the project is in fair condition with areas which require maintenance, repair and monitoring. No evidence of immediate structural instability was observed in the dam, spillway, or appurtenant structure.

Based upon "Preliminary Guidance for Estimating Maximum Probable Discharges" dated March 1978, the watershed area and classification, and hydraulic/hydrologic computations, the peak inflow to the pond at test flood is 850 cfs; peak outflow is 580 cfs with the lowest point of the embankment overtopped by 0.4 feet. The spillway capacity to the low point of the embankment is 380 cfs which is equivalent to approximately 66% of the routed test flood outflow.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the project must be based solely on visual inspection, past performance and sound engineering judgement.

c. Urgency - It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within 1 (one) year of the owner's receipt of this report.

7.2 RECOMMENDATIONS

It is recommended that further studies be made by a registered professional engineer qualified in dam design and inspection pertaining to the following items. Recommendations made by the engineer should be implemented by the owner.

1. A detailed hydraulic analysis of the adequacy of the project discharge and existing outlet facilities.

2. An inspection of the low-level outlet facilities to evaluate the sluice gate mechanism and the condition of the concrete valve chamber.

3. A detailed inspection of the spillway and spillway discharge channel when no water is flowing over the spillway. This should include an evaluation of the discharge channel erosion and possible undermining of the spillway chute.

4. Determination of the origin and significance of seepage and wetness at the eroded area adjacent to the spillway and at the toe of the embankment.

5. An evaluation of the condition of the embankment toe drains, in particular, an assessment of any possible siltation of the pipes, which may be reducing their efficiency.

6. Development of a program to prevent further scouring at the spillway toe and erosion of the right bank of the discharge channel. This program should include provisions for slope drainage in the area of the erosion.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken by the owner within the length of time indicated in section 7.1.c, and continued on a regular basis:

1. Round-the-clock surveillance should be provided during periods of heavy precipitation or high project discharges. A formal downstream warning system should be developed, to be used in case of emergencies at the dam.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.

3. A comprehensive program of inspection by a registered professional engineer qualified in dam inspection should be instituted on an annual basis.

4. Displaced riprap and eroded areas on the upstream slope of the embankment should be restored.

5. Cracks in the concrete of the spillway training walls should be sealed.

6. The scouring and erosion of the spillway discharge channel should repaired, including clearing of obstacles and placement of riprap or other suitable measures undertaken to prevent further deterioration of this area.

7. Rates of seepage from the two 6 inch drain pipes at the low-level outlet headwall should be monitored periodically to evaluate the condition of the embankment and the effectiveness of the toe drain system.

8. The spillway and low-level outlet channels should be cleared of rocks, logs, soil deposits, brush and overhanging trees. The low-level outlet channel should be graded to flow freely into the downstream channel in order to eliminate stagnant water in the outlet channel and allow for free outflow from the toe drains.

9. The sluice gate of the low-level outlet should be opened once a year to check all the outlet facilities and flush out the low-level outlet channel.

10. Removal of brush and saplings on the crest, slopes and toe of the dam should be expanded to include the section of the embankment to the right of the spillway and continued as part of the routine maintenance procedures at the dam.

7.4 ALTERNATIVES

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Dooley Pond Dam DATE: 4-21-80

TIME: 8:30 AM

WEATHER: Sunny 65°

W.S. ELEV. 249.1 U.S. 232± DN.S

PARTY:	INITIALS:	DISCIPLINE:
1. Peter Heynen	PH	Geotechnical
2. Miron Petrovsky	MP	Geotechnical
3. Theodore Stevens	TS	Geotechnical
4. Hector Moreno	HM	Hydraulics
5. Robert Jahn	RJ	Hydraulics
6.		

PROJECT FEATURE	INSPECTED BY	REMARKS
1. Dam Embankment	PH, MP, TS, HM, RJ	
2. Concrete Spillway	PH, MP, TS, HM, RJ	
3. 24" Low-level Outlet Pipe	PH, MP, TS, HM, RJ	
4. Low-level Outlet Headwall	PH, MP, TS, HM, RJ	
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		

PERIODIC INSPECTION CHECK LIST

PROJECT Dooley Pond Dam DATE 4-21-80

PROJECT FEATURE Embankment BY PH, MP, TS, HM, RS

AREA EVALUATED		CONDITION
DAM EMBANKMENT		
Crest Elevation		252.2 – 252.5
Current Pool Elevation		249.1
Maximum Impoundment to Date		Not known
Surface Cracks		No
Pavement Condition		NA
Movement or Settlement of Crest		None Observed
Lateral Movement		None Observed
Vertical Alignment		Appears Good
Horizontal Alignment		Appears Good
Condition at Abutment and at Concrete Structures		Fair – Erosion on US slope near spillway
Indications of Movement of Structural Items on Slopes		None
Trespassing on Slopes		Yes – US Slope
Sloughing or Erosion of Slopes or Abutments		Some erosion – US slope
Rock Slope Protection-Riprap Failures		Some riprap missing – US slope
Unusual Movement or Cracking at or Near Toes		None observed
Unusual Embankment or Downstream Seepage		No, but are wet areas at toe
Piping or Boils		
Foundation Drainage Features		—
Toe Drains		Not flowing freely – possible siltation
Instrumentation System		

PERIODIC INSPECTION CHECK LIST

PROJECT Dooley Pond Dam DATE 4-21-80

PROJECT FEATURE Concrete Spillway BY PH, MP, TS, HM, RS

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		
a) Approach Channel		
General Condition		Good
Loose Rock Overhanging Channel		No
Trees Overhanging Channel		No
Floor of Approach Channel		Riprap - drops off quickly
b) Weir and Training Walls		
General Condition of Concrete		Good
Rust or Staining		None
Spalling		None
Any Visible Reinforcing		No
Any Seepage or Efflorescence		No
Drain Holes		
c) Discharge Channel		
General Condition		Poor
Loose Rock Overhanging Channel		None
Trees Overhanging Channel		Small Trees in Channel
Floor of Channel		Eroded - Some riprap
Other Obstructions		Barbed Wire Fence across channel

PERIODIC INSPECTION CHECK LIST

PROJECT Dooley Pond Dam DATE _____

PROJECT FEATURE 24" Low-Level Outlet Pipe BY PH, MP, TS

AREA EVALUATED		CONDITION
OUTLET WORKS-TRANSITION AND CONDUIT		24" Conc. Pipe
General Condition of Concrete		Good
Rust or Staining on Concrete		Some
Spalling		None
Erosion or Cavitation		None
Cracking		None
Alignment of Monoliths		—
Alignment of Joints		—
Numbering of Monoliths		—

PERIODIC INSPECTION CHECK LIST

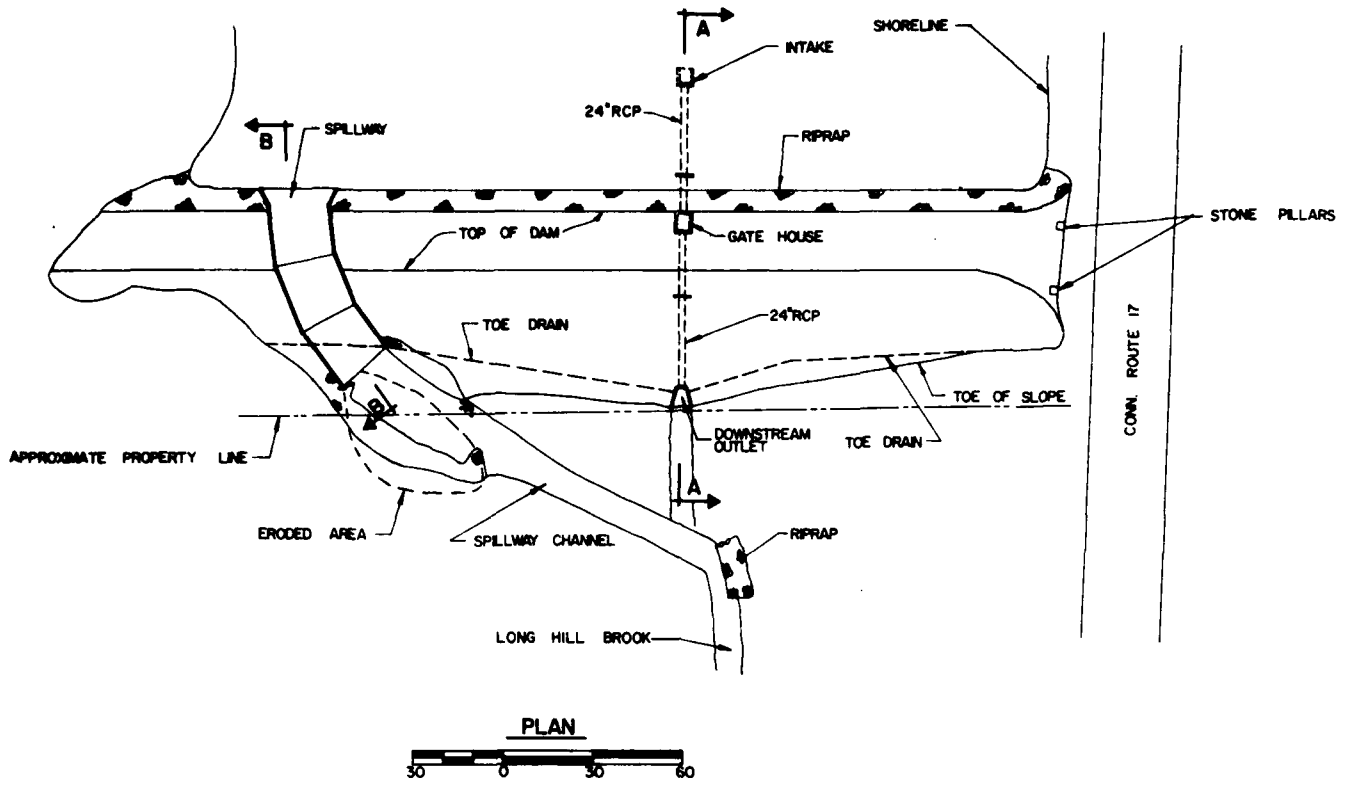
PROJECT Dooley Pond Dam DATE 4-21-80

PROJECT FEATURE Low-Level Outlet Headwall BY PH, MP, TL, HM, KJ

AREA EVALUATED		CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL		
General Condition of Concrete		Good
Rust or Staining		Some
Spalling		No
Erosion or Cavitation		No
Visible Reinforcing		No
Any Seepage or Efflorescence		Yes - some seepage
Condition at Joints		Good
Drain Holes		Yes - 2 6" tile
Channel		Small - sand & silt
Loose Rock or Trees Overhanging Channel		Yes
Condition of Discharge Channel		Poor - Fence obstructing channel, stagnant water in channel

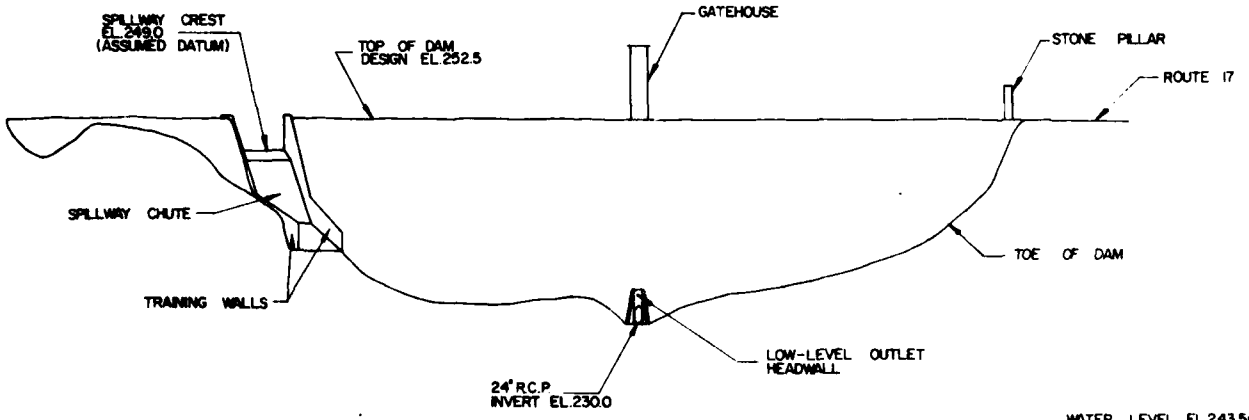
APPENDIX B

ENGINEERING DATA AND CORRESPONDENCE



PLAN

30 0 30 60



ELEVATION

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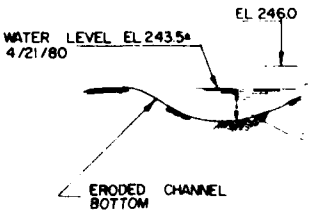
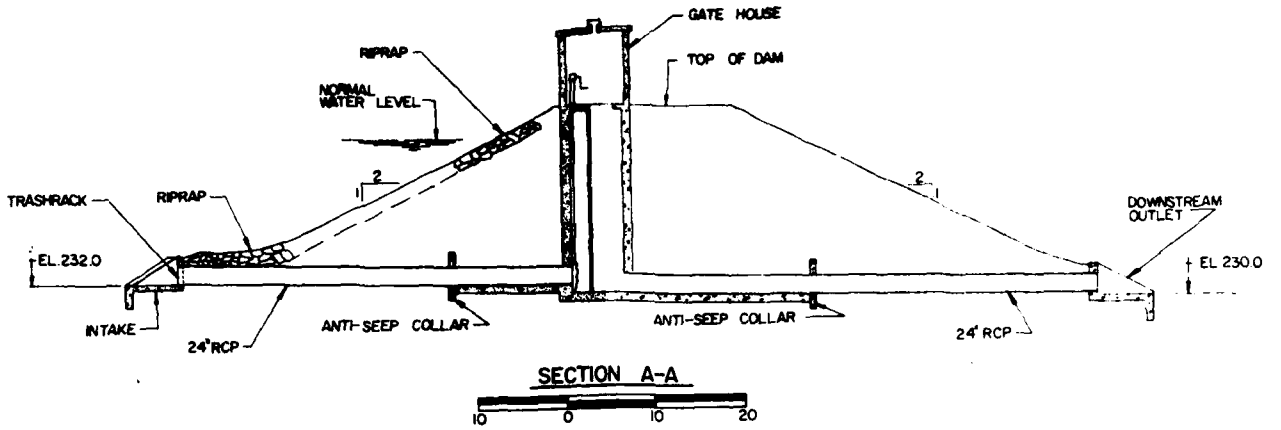
10 0 10 20





SECTION A-A

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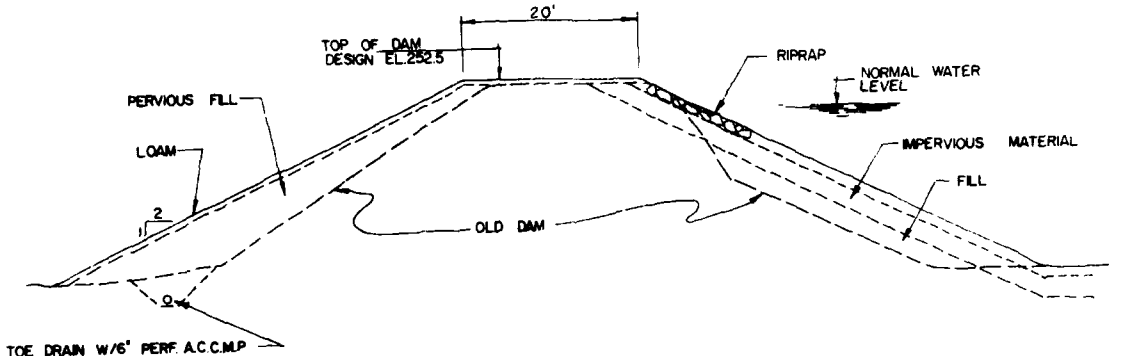

TYPICAL CROSS SECTION

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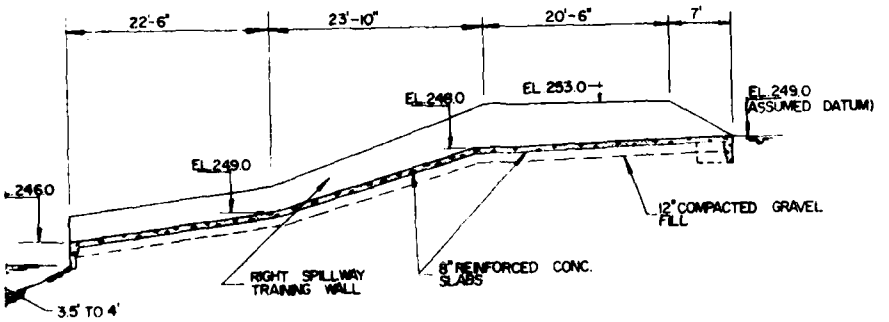


SECTION B-B

10 0 10 20

NOTES:

1. THIS PLAN WAS COMPILED FROM PLANS ENTITLED "REPAIR OF DOOLEY POND DAM" BY A.J. MACCHI ENGINEERS DATED APRIL 15, 1966. THE ERODED AREA AT THE TOE OF THE SPILLWAY IS SKETCHED IN PLAN AND SECTION ACCORDING TO OBSERVATIONS MADE BY CAHN ENGINEERS DURING THE INSPECTION OF THE DAM ON APRIL 21, 1980.
2. THE WATER SURFACE ELEVATION OF 249.0 FOR THE POND SHOWN ON THE U.S.G.S. MIDDLETOWN QUADRANGLE MAP WAS ASSUMED TO BE THE ELEVATION OF THE SPILLWAY CREST. ALL OTHER ELEVATIONS SHOWN ARE REFERENCED TO THIS ASSUMED DATUM, AS CONVERTED FROM THE EXISTING PLANS.

CAHN ENGINEERS INC WALLINGFORD, CONNECTICUT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

PLAN, ELEVATION & SECTIONS

DOOLEY POND DAM

LONG HILL BROOK — MIDDLETOWN, CONNECTICUT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE AS NOTED	
M. Norman	TJS		DATE MAY 1980	SHEET B-1

2

DOOLEY POND DAM

EXISTING PLANS

"Repair of Dooley Pond Dam"
A. J. Macchi Engineers
Hartford, Connecticut
April 15, 1966
(3 sheets)

"Revised Typical Cross-Section"
A. J. Macchi Engineers
Hartford, Connecticut
(no date)

SUMMARY OF DATA AND CORRESPONDENCE

DATE	TO	FROM	SUBJECT	PAGE
Sept. 14, 1944	J. Howard Carl Middletown, Ct.	V. B. Clarke, Engineer State Board of Supervision of Dams	Recommendations for repair of dam	B-3
April 16, 1963	File	State Board of Supervision of Dams	Inventory Data	B-4
July 19, 1963	William P. Sander Water Resources Commission	John J. Mozzochi Civil Engineers	Inspection Report	B-5
June 20, 1966	William P. Sander	John J. Mozzochi	Review of plans for repair of dam	B-6
July 19, 1966	Board of Fisheries and Game State of Connecticut	William S. Wise Director, Water Resources Commission	Construction Permit	B-7
Oct. 2, 1967	Water Resources Commission	Board of Fisheries and Game	Completion of repairs to dam	B-9
Oct. 17, 1967	Board of Fisheries and Game	John J. Curry Director, Water Resources Commission	Certificate of Approval	B-10
1971	-	State of Connecticut Dept. of Environmental Protection	Bathymetric map of Dooley POnd	B-11

September 14, 1944 V. B. Clarke

Mr. J. Howard Carl
377 Ridge Road,
Middletown, Conn.

Dear Mr. Carl:

Confirming the opinions expressed to you at the time of the inspection last Saturday, September 9th, would say that in general it is my opinion that this dam is safe providing certain repairs and adjustments are made as follows:

1. Provide a proper spillway at the Easterly end of the dam to replace the 30 inch corrugated pipe which exists there at present. I would suggest making this spillway as wide as you conveniently can, not less than 10 feet, and the same should be concreted to prevent scour.

2. Repair the broken sections of the wall on the upstream or Southerly side of the dam.

3. Provide a proper control gate for drawing down the water in the pond.

4. Reinforce the wall on the Northerly side of the dam where the same is bulged. This I suggested to you could be done by stone riprap.

5. Repair the earth embankment in back of the walls [illegible] by additional filling.

My opinion of the safety of this dam is based on the fact that it appears to be a very old one and with minor damage withstood the Hurricane Flood of 1938. How the same was originally constructed of course I do not know. It may have been a rock filled dam or constructed with a core wall and earth embankments. The area of the water shed appears to be somewhere around three quarters of a square mile.

Very truly yours,

V. B. Clarke, Engineer
State Board of Supervision of Dams

VBC:W
cc: General Sanford H. Wadhams,
Chairman.

16 APRIL 1963 Built 1870?

WPS

III-36 7

CT-142

STATE BOARD FOR THE SUPERVISION OF DAMS
INVENTORY DATA

Name of Dam or Pond DOOLEY POND

Code No. C 275 SB 08 LH 40 Long 11-40.1

Location of Structure:

Town MIDDLETOWN Lat 41-30.9

Name of Stream LONG HILL BROOK BUILT 1870?

U.S.G.S. Quad. MIDDLETOWN

Owner STATE BOARD OF FISHERIES AND GAME ? ok 7/73

Address

Pond Used For RECREATION - FISHING - BOATING D.A. 0.675 M

Dimensions of Pond: Width ℮ 600 FEET Length ℮ 2000 FEET Area ~~28~~ 28.4 ACRES

Total Length of Dam ℮ ~~200~~ 320' FEET Length of Spillway ~~℮ 3 FEET~~ 20'

Depth of Water Below Spillway Level (Downstream) ℮ 20 FEET

Height of Abutments Above Spillway ℮ 4 FEET

Type of Spillway Construction OVERFLOW CHANNEL ON EAST SIDE ... rock etc

Type of Dike Construction ROCK AND EARTH

Downstream Conditions FIELDS - ROADS

Summary of File Data INSPECTED ON 9 SEPTEMBER 1944 BY V B. CLARKE. HE STATED THAT A NUMBER OF REPAIRS ARE NECESSARY TO MAKE THE DAM SAFE.

Remarks THIS IS A LARGE DAM AND FAILURE WOULD CAUSE DAMAGE DOWNSTREAM. THERE IS ABOUT ½ cfs LEAKAGE FROM THE CENTER OF THE DAM. THE DAM SHOULD BE INSPECTED BY A BOARD MEMBER.

MOZZOCHI INSPECTED DAM AND FOUND IT IN NO IMMEDIATE DANGER OF FAILURE.

B-4

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

GLASTONBURY, CONN.
217 HEBRON AVENUE
PHONE MEDFORD 3-9401

PROVIDENCE 3, R. I.
200 DYER STREET
PHONE GASPEE 1-0420

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCHS, JR.
ECTOR L. GIOVANNINI

July 19, 1963

REPLY TO: Glastonbury

William P. Sanders-Engineer-Geologist
Water Resources Commission
State Office Building
Hartford 15, Connecticut

Our File 57-73-55

Re: Dooley Pond
Middletown, Connecticut
Code No. C27.5 SB 0.8 LH 4.0

Dear Mr. Sanders:

In accordance with your instructions of July 8, 1963, I made an inspection of the referenced dam on July 15th, and have the following to report:

The drainage area for this dam is about 420 acres $\pm$ with a pond area about 20 acres. There is no spillway, as such, but discharge is through a ditch at the northeast corner of the pond. I found some leakage in the center of the dam but part of it appeared to be from a plugged pipe which may have been an old draw-down pipe.

I think this dam is quite safe at the present time and my only recommendation is to have the several large trees removed from the embankment.

Very truly yours,

John J. Mozzochi and Associates
Civil Engineers

JJM:hk

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

GLASTONBURY, CONN. 06033
217 HEBRON AVENUE
PHONE 633-9401

PROVIDENCE, R. I. 02903
200 DYER STREET
PHONE GASPEE 1-0420

JOHN J. MOZZOCHI
ASSOCIATES
OWEN J. WHITE
JOHN LUCHS, Jr.
ECTOR L. GIOVANNINI

June 20, 1966

REPLY TO: Glastonbury

William P. Sander-Engineer-Geologist
Water Resources Commission
317 State Office Building
Hartford, Connecticut 06115

Re: Our File 57-73-77
Dooley Pond
Middletown, Connecticut

Dear Mr. Sander:

In accordance with your instructions dated June 15th, I have reviewed the plan dated 4-15-66 submitted by A. J. Macchi Engineers for the repairs to the referenced dam.

I inspected the site on June 17th and noted that leakage through the center of the dam has increased considerably over the amount that was noted at the time of my last inspection on July 15, 1963. This leakage has been a continuing occurrence since the first report by V. B. Clarke in 1944.

I suggest that the riprap proposed for the entire depth of the upstream face of the dam be required only between elevation $94^{\pm}$ and the top of dam (elev. of 100.5) and that a two (2') foot blanket of impervious material be required for the entire surface of the upstream face. I would also suggest that the present masonry and riprap of the upstream face be removed before this impervious blanket is placed. This material can be salvaged and reused as riprap and thereby reduce the cost of bringing in additional riprap.

In all other respects, the plans can be approved and a Construction Permit issued.

Very truly yours,

John J. Mozzochi and Associates
Civil Engineers

JJM:hk

STATE OF CONNECTICUT

WATER RESOURCES COMMISSION

STATE OFFICE BUILDING · HARTFORD 15, CONNECTICUT

CONSTRUCTION PERMIT FOR DAM

July 19, 1966

Board of Fisheries and Game
State Office Building
Hartford, Connecticut

TOWN: Middletown
RIVER: Summer Brook
TRIBUTARY: Long Hill Brook

Gentlemen:

Your application for a permit to (repair) a dam on Long Hill Brook known as Dooley Pond Dam in the Town of Middletown in accordance with plans prepared by A. J. Macchi, Engineers dated April 15, 1966 has been reviewed.

The construction, in accordance with those plans, is APPROVED under the conditions which follow.

I. The Commission shall be notified as follows:

A. When construction is started.
B. When project is complete and ready for final inspection.

II. This permit with the plans and specifications must be kept at the site of the work and made available to the Commission at any time during the construction.

III. If any changes are contemplated or required, the Commission must be notified and supplementary approval obtained.

IV. If the construction authorized by this permit is not started within two years of the date of this permit and completed within four years of the same date, this permit must be renewed.

V. Additional requirements -

SEE ATTACHED SHEET

STATE OF CONNECTICUT
WATER RESOURCES COMMISSION
STATE OFFICE BUILDING - HARTFORD, CONNECTICUT 06115

V. Additional requirements -

1. That the rip-rap proposed for the entire depth of the upstream face of the dam be required only between elevation 94± and the top of the dam (elevation 100.5) and that a two foot blanket of impervious material be required for the entire surface of the upstream face.

2. That the present masonry and rip-rap of the upstream face be removed before impervious blanket is placed.

William S. Wise

William S. Wise, Director

FORM PUR STO 200

INTERDEPARTMENT MAIL

DATE: 10-2-67

TO: John J. Curry, Director — DEPARTMENT: Water Resources Commission

FROM: Theodore B. Bampton, Director — DEPARTMENT: Board of Fisheries and Game

SUBJECT: Dooley Pond Dam, Middletown

The repairs to Dooley Pond Dam, Middletown, were completed on August 4, 1967.

H/B

Theodore B. Bampton Jr.

FORM PUR STO 200

INTERDEPARTMENT MAIL

DATE: 10/17/67

TO: File — DEPARTMENT:

FROM: William P. Sander — DEPARTMENT: Water Resources Commission

SUBJECT: Middletown - Dooley Pond Dam

On October 10, 1967, an inspection was made of the subject dam. The dam was found to be in good condition and it is my recommendation that a Construction Permit be issued.

W P Sander

Engineer-Geologist

STATE OF CONNECTICUT

WATER RESOURCES COMMISSION

State Office Building · Hartford 15, Connecticut

CERTIFICATE OF APPROVAL

October 17, 1967

Board of Fisheries and Game
State Office Building
Hartford, Connecticut

TOWN: Middletown
RIVER: Sumner Brook
TRIBUTARY: Long Hill Brook
CODE NO.: C27.5 SB0.8 LH4.0

NAME AND LOCATION OF STRUCTURE: Dooley Pond Dam, located on LongHill Brook in the Town of Middletown

DESCRIPTION OF STRUCTURE AND WORK PERFORMED:

Repair of an earth dam with the construction of a concrete spillway

July 19, 1966 and amended September 20, 1966

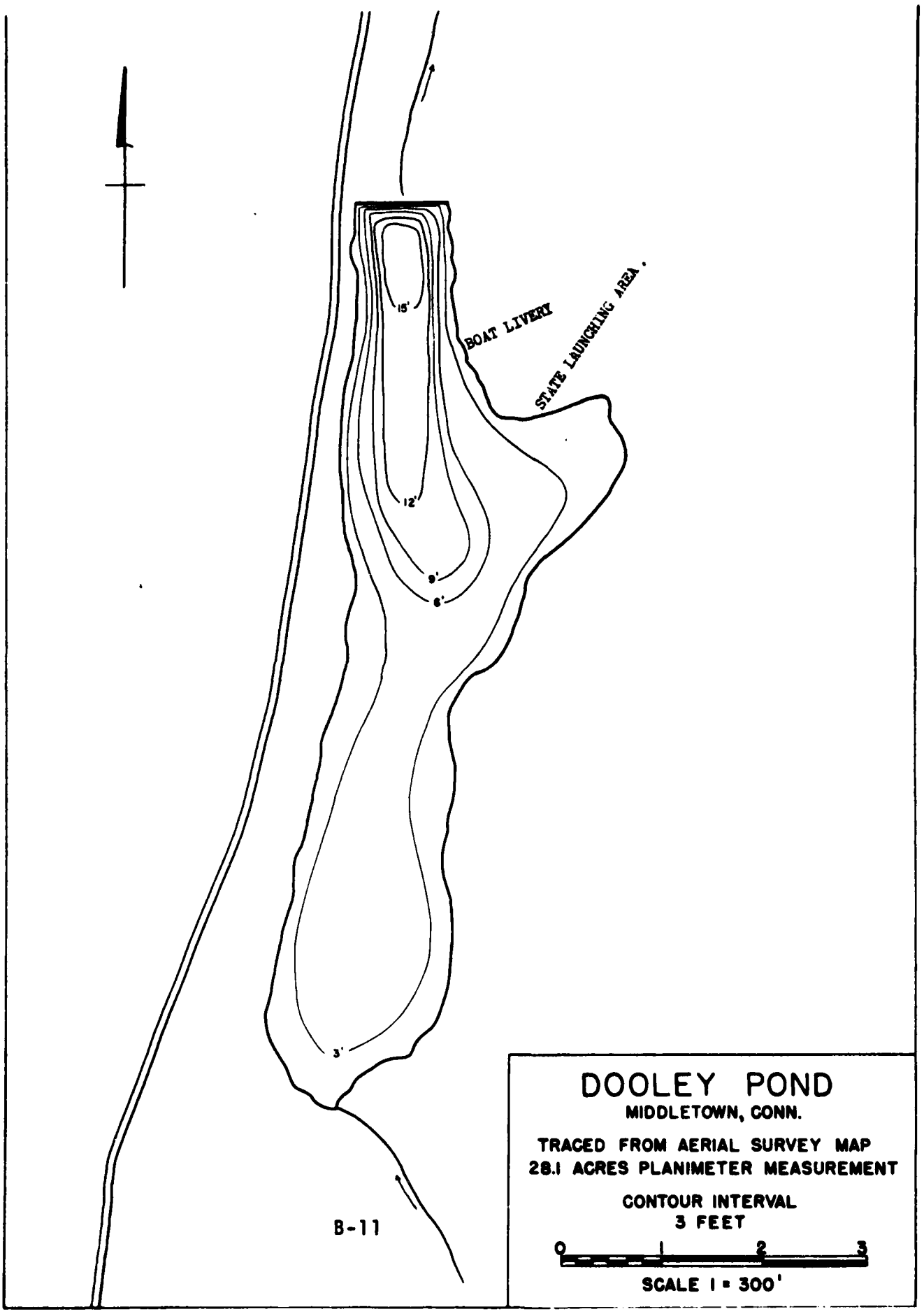
CONSTRUCTION PERMIT ISSUED UNDER DATE OF:

This certifies that the work and construction included in the plans submitted, for the structure described above, has been completed to the satisfaction of this Commission and that this structure is hereby approved in accordance with Section 25-114 of the 1958 Revision of the General Statutes.

The owner is required by law to record this Certificate in the land records of the town or towns in which the structure is located.

WATER RESOURCES COMMISSION

BY: _____
[redacted], Director
John J. Curry,



DOOLEY POND

MIDDLETOWN, CONN.

TRACED FROM AERIAL SURVEY MAP
28.1 ACRES PLANIMETER MEASUREMENT

CONTOUR INTERVAL
3 FEET

0 1 2 3

SCALE 1 = 300'

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

LAKE AND POND SURVEY SERIES NO. 11

DOOLEY POND

Dooley Pond is located in Middlesex County in the Town of Middletown. This small state-owned pond has a surface area of 28 acres, a maximum depth of 16 feet and an average depth of 4.9 feet. The pond is impounded by a recently rebuilt earthen dam, concrete spillway and a control gate which allows complete control of the water level. It is fed by bottom springs and two small brooks. The pond bottom is mostly of mud with some areas of sand, gravel and rubble. Emergent vegetation is scarce. Submerged vegetation is extremely abundant, particularly in the shallow southern end of the pond. During much of the late spring, summer and early fall, a dense algal bloom reduces transparency to less than two feet. Much of the shoreline and surrounding areas are in open pastrue and as a result, Dooley Pond is extremely fertile.

There is a boat livery located near the dam and privately owned picnic facilities are available for a fee. Public access to this impoundment is provided through a state-owned boat launching area located on the eastern side of the pond.

Although historical stocking records for this pond are not available, it is safe to assume that past stocking has included such species as largemouth bass, white perch and black crappie. These three species, not native to inland waters in Connecticut are present in Dooley Pond.

During the dam repair work carried out in 1967, the pond was drawn down very low resulting in the loss of much of the fish population. After the pond refilled, it was restocked with largemouth bass, yellow perch and landlocked alewives. White perch and common sunfish are also present.

Largemouth bass and panfish exhibit excellent growth rates and should provide good to excellent fishing.

Periodic severe drawdown should be used as a management tool to keep the white perch, yellow perch and sunfish populations under control.

APPENDIX C

DETAIL PHOTOGRAPHS

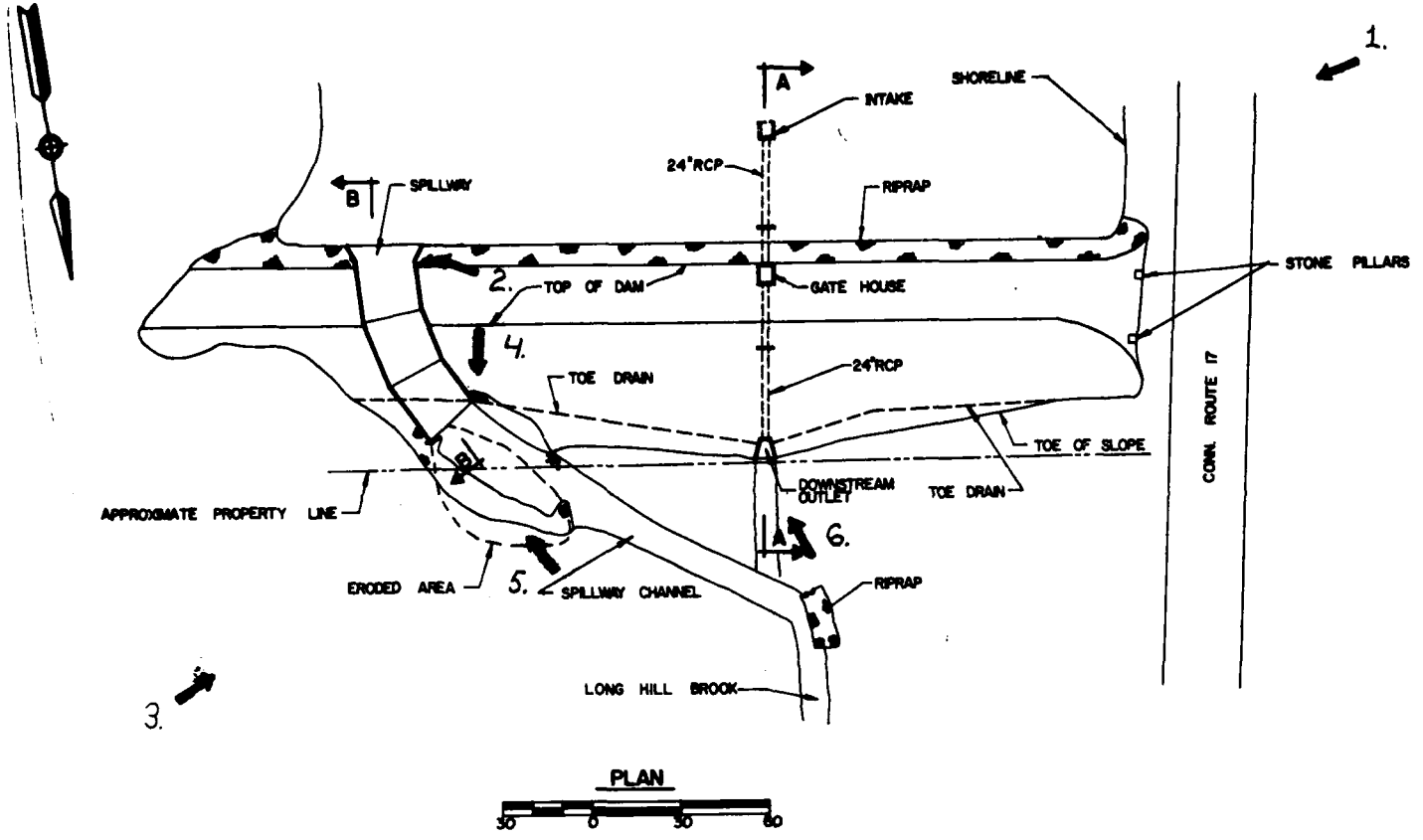


PHOTO LOCATION PLAN

DOOLEY POND DAM

SHEET C-1

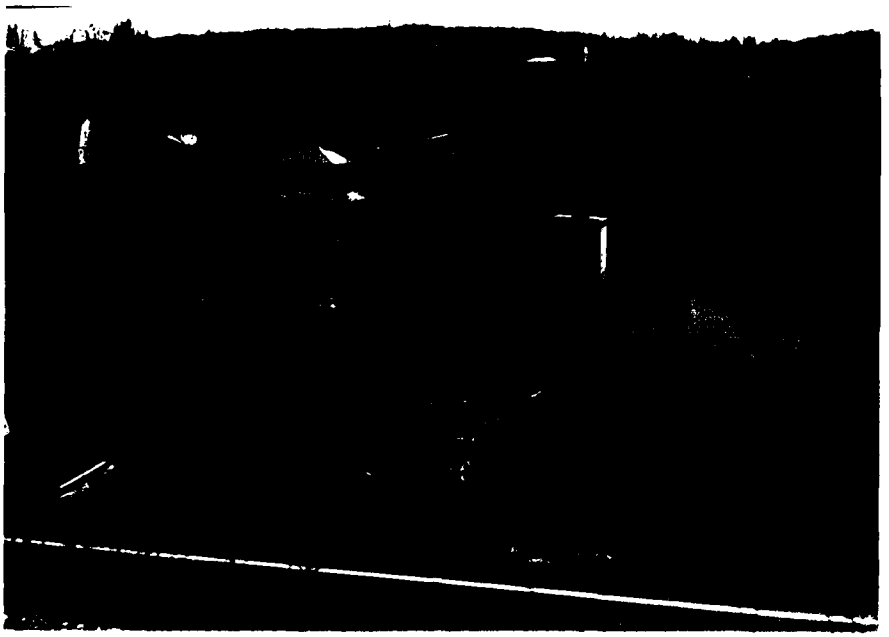


Photo 1 - Upstream slope and top of dam (4/21/80).

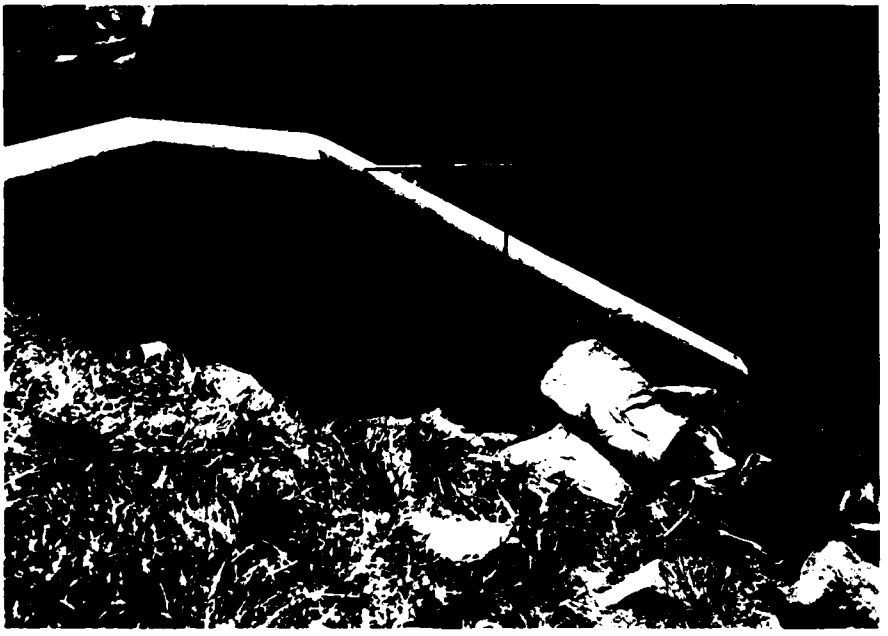


Photo 2 - Displaced riprap and erosion of upstream slope (4/21/80).

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS. CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Dooley Pond Dam Long Hill Brook Middletown, Conn. CE# 27 785 KA DATE May '80 PAGE C-1

Photo 3 - Downstream slope and toe of dam (4/21/80).

Photo 4 - Eroded area of spillway discharge channel (4/21/80).

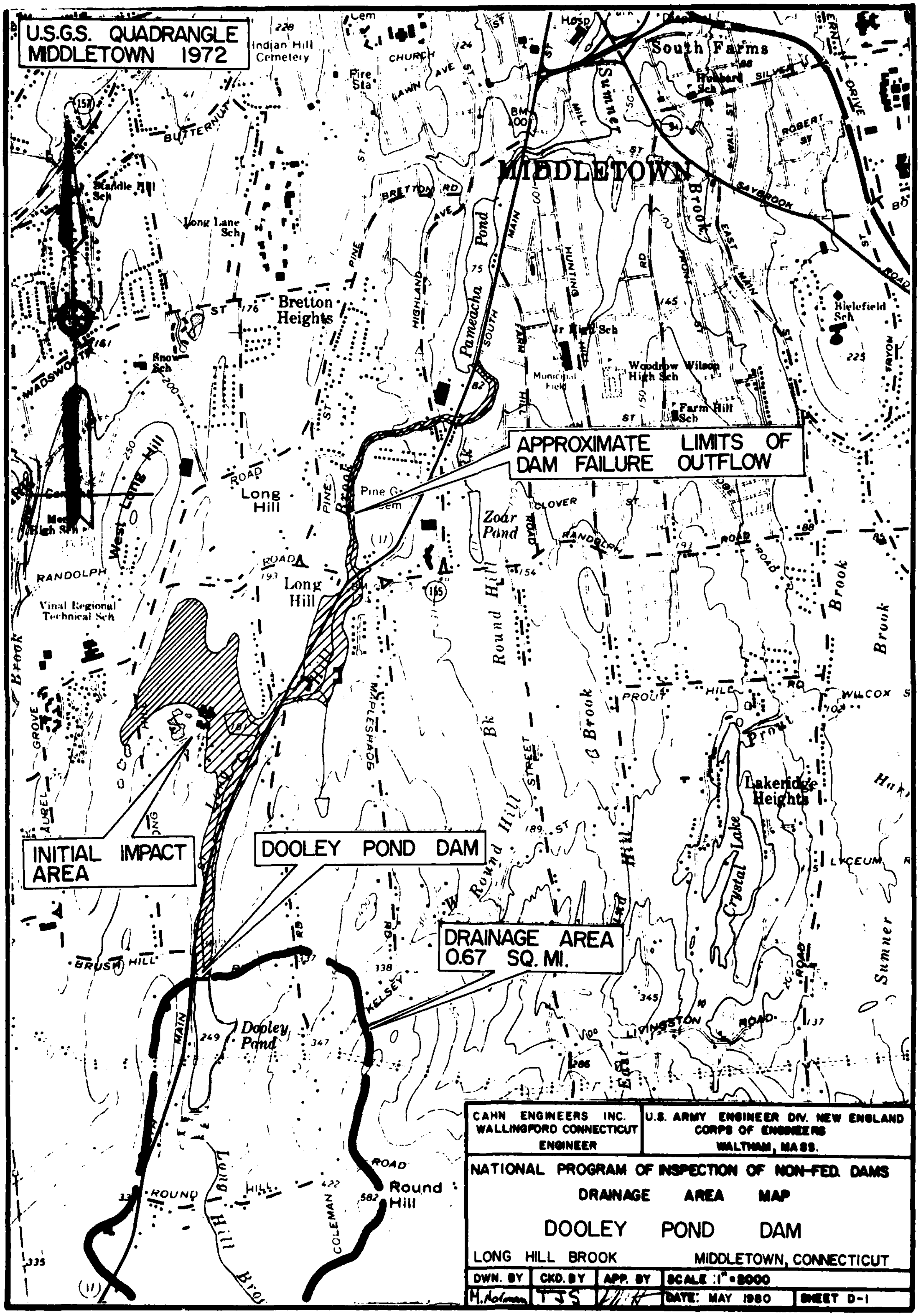
US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Dooley Pond Dam Long Hill Brook Middletown, Conn.
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE# 27 785 KA DATE May '80 PAGE C-2

Photo 5 - Concrete spillway chute. Note drop off at end of chute and debris in channel (4/21/80).

Photo 6 - Low-Level outlet headwall. Note stagnant water in outlet and partially submerged drain pipe to left of 24" outlet pipe (4/21/80).

APPENDIX D

HYDRAULICS/HYDROLOGIC COMPUTATIONS



U.S.G.S. QUADRANGLE
MIDDLETOWN 1972
APPROXIMATE LIMITS OF
DAM FAILURE OUTFLOW
INITIAL IMPACT
AREA
DOOLEY POND DAM
DRAINAGE AREA
0.67 SQ. MI.
MIDDLETOWN
South Farms
Bretton Heights
Long Hill
Pameacha Pond
Zoar Pond
Dooley Pond
Lakeridge Heights
Crystal Lake
Round Hill
CAHN ENGINEERS INC.
WALLINGFORD CONNECTICUT
ENGINEER
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
DRAINAGE AREA MAP
DOOLEY POND DAM
LONG HILL BROOK
MIDDLETOWN, CONNECTICUT
DWN. BY
CKD. BY
APP. BY
SCALE :1" = 2000
DATE: MAY 1980
SHEET D-1

HYDROLOGIC/HYDRAULIC INSPECTION

DOOLEY POND DAM, MIDDLETOWN, CT.

I) PERFORMANCE AT PEAK FLOOD CONDITIONS:

1) PROBABLE MAXIMUM FLOOD (PMF)

a) WATERSHED CLASSIFIED AS "ROLLING"

b) WATERSHED AREA: D.A. = 0.67 sq mi

NOTE: D.A. FROM CONN. DEP. BULLETIN No. 1, 1972 (GAZETTEER OF NATURAL DRAINAGE AREAS) p. 39.

c) PEAK FLOODS (FROM NED-ACE GUIDELINES - GUIDE CURVES FOR PMF)

i) FROM GUIDE CURVES BY EXTRAPOLATION TO D.A. < 2 sq mi:

$$CSM = 2500 \text{ cfs/sq mi}$$

ii) PMF = 2500 × 0.67 = 1700 cfs

iii) ½ PMF = 850 cfs

2) SURCHARGE AT PEAK INFLOWS (PMF AND ½ PMF)

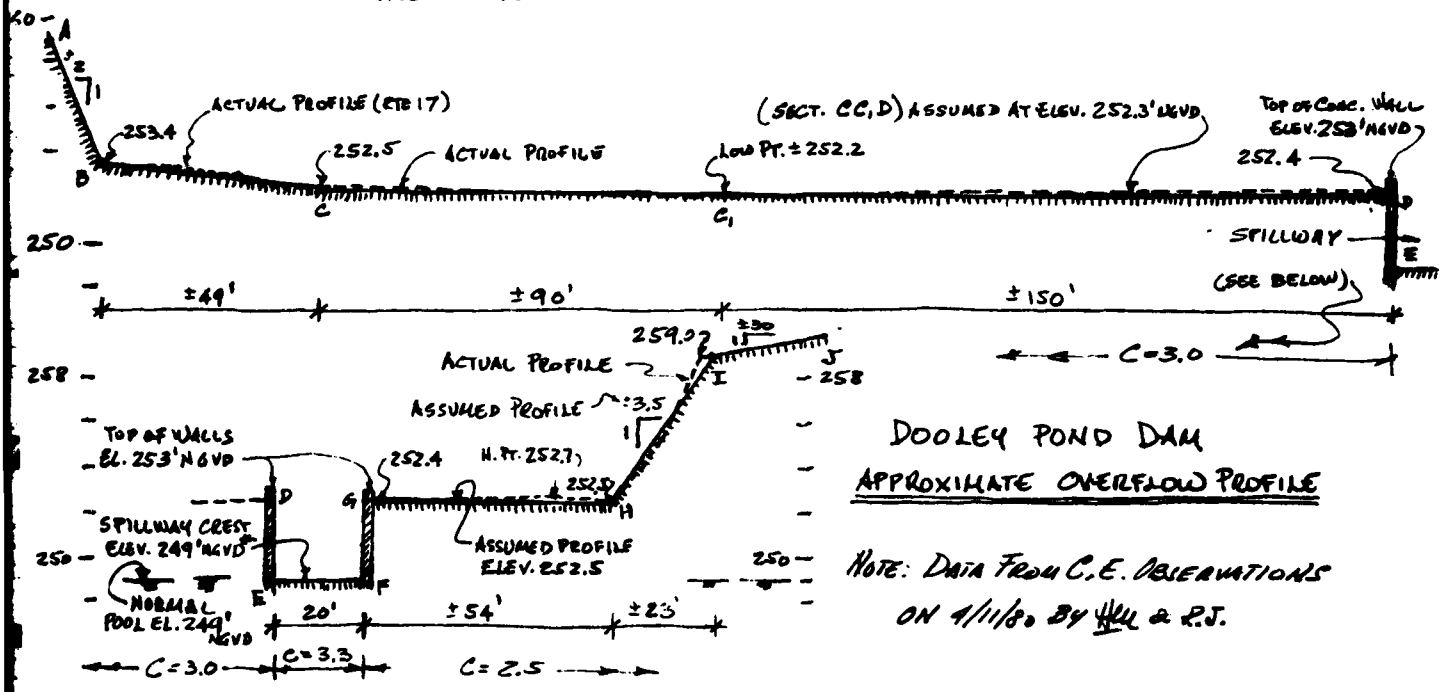
a) OUTFLOW RATING CURVE:

i) SPILLWAY AND OVERFLOW PROFILE FOR SURCHARGES OVERTOPPING THE DAM:

SPILLWAY, 20' LONG, TRIANGULAR, U/S RIP-RAP LINED FACE ON (±) 2" TO 1" SLOPE AND D/S CONCRETE PAVED APRON (CHUTE) WITH THE SECTION VARIES TO THE CREST ON (±) 23.5" TO 1" SLOPE.
THE DAM AND ADJACENT TERRAIN TO THE LEFT, ARE MAINLY GRASSED (PAVED ACROSS RTE 17); TO THE RIGHT, THE DAM AND ADJACENT TERRAIN ARE

HEAVILY COVERED BY YOUNG MAPLE TREES SOME EVERGREENS AND BRUSH.

THEREFORE, ASSUME C=3.3 FOR THE SPILLWAY FLOW AND, RESPECTIVELY, C=3.0 AND C=2.5 FOR THE CLEAR AND WOODED PORTIONS OF THE DAM AND ADJACENT TERRAIN (SEE PROFILE).



DOOLEY POND DAM
APPROXIMATE OVERFLOW PROFILE

NOTE: DATA FROM C.E. OBSERVATIONS ON 4/11/80 BY HH & R.J.

ii) THEREFORE, ASSUMING EQUIVALENT LENGTHS FOR THE SLOPING TERRAIN, THE OVERFLOW RATING CURVE FOR THE DISCHARGE (H) ABOVE THE SPILLWAY CREST CAN BE APPROXIMATED AS FOLLOWS:

1') SECTION AB: $Q_{AB} = \frac{2}{3} \times 2 \times 3 (H - 4.4)^{3/2} = \underline{4 (H-4.4)^{3/2}}$

2') SECTION BC: $(Q_{BC})_1 = \frac{2}{3}\left(\frac{49}{0.9}\right) \times 3 (H-3.5)^{3/2} = \underline{109 (H-3.5)^{3/2}}$ H≤4.4

$(Q_{BC})_2 = 3 \times 49 (H-3.71)^{3/2} = \underline{147 (H-3.71)^{3/2}}$ H>4.4

*NOTE: W.S. ELEV. 249' MSL ON THE U.S.G.S. MIDDLETOWN, CT. QUADRANGLE SHEET (REV. 1972) IS ASSUMED TO BE SPILLWAY CREST ELEVATION ON NATIONAL GEODETIC VERTICAL DATUM (NGVD)

3') SECTION CC, D: $Q_{CC,D} = 3 \times 240 (H-3.3)^{3/2} = \underline{720 (H-3.3)^{3/2}}$

4') SPILLWAY (SECTION EF): $Q_S = Q_{EF} = 3.3 \times 20 H^{3/2} = \underline{66 H^{3/2}}$

5') SECTION GH: $Q_{GH} = 2.5 \times 54 (H-3.5)^{3/2} = \underline{135 (H-3.5)^{3/2}}$

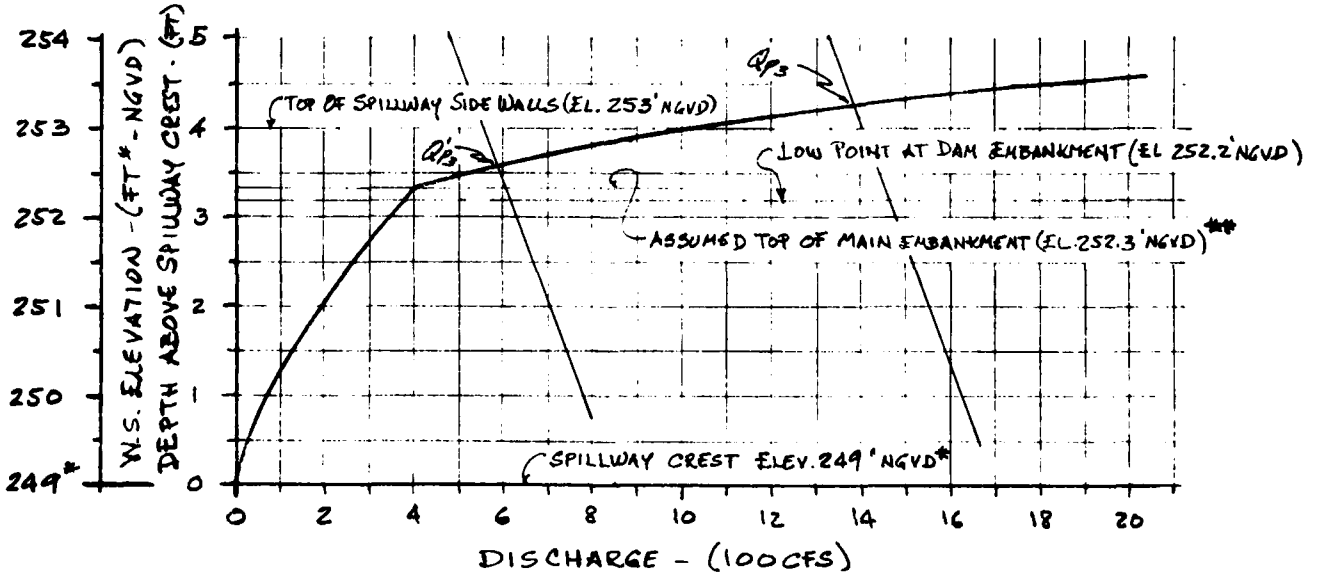
6') SECTION HI: $(Q_{HI})_1 = \frac{2}{3} \times 3.5 \times 2.5 (H-3.5)^{5/2} = \underline{5.83 (H-3.5)^{5/2}}$ $H \leq 10$

$(Q_{HI})_2 = 23 \times 2.5 (H-5.08)^{3/2} = \underline{57.5 (H-5.08)^{3/2}}$ $H > 10$

7') SECTION IJ: $Q_{IJ} = \frac{2}{3} \times 30 \times 2.5 (H-10)^{5/2} = \underline{50 (H-10)^{5/2}}$

THEREFORE, THE TOTAL OVERFLOW IS APPROXIMATED BY THE SUM OF ALL THE APPLICABLE FORMULAE ON ITEMS (1') TO (7')

(iii) DOOLEY POND DAM - OUTFLOW RATING CURVE



* SEE NOTE p. D-2

** TOP OF EMBANKMENT; DESIGN ELEV. 252.5' NGVD (SEE THE CT. BOARD OF FISHERIES AND GAME "REPAIR OF DOOLEY POND DAM" DWGS., DATED APR. 1966).

b) SURCHARGE HEIGHT TO PASS INFLOWS (Q_{P_1} & Q'_{P_1})

i) @ Q_{P_1} = PMF = 1700 CFS $H_1 = 4.4'$

ii) @ $Q'_{P_1} = \frac{1}{2}$ PMF = 850 CFS $H'_1 = 3.9'$

c) EFFECT OF SURCHARGE STORAGE - PEAK OUTFLOWS:

i) AVE LAKE AREA ($\bar{A}$) WITHIN EXPECTED SURCHARGE:

1') LAKE AREA AT FLOW LINE (EL. 249' NGVD): * $A_{WL} = 28.1$ AC
2') AREA AT CONTOUR 260' NGVD (MSL)*: $A_{260} = 36.7$ AC

∴ AVE AREA WITHIN MAX. EXPECTED SURCHARGE (+4.4'): $\bar{A} = 30$ AC
(LINEAR INTERPOLATION)

*NOTE: LAKE AREA AT FLOW LINE ASSUMED TO BE THE VALUE GIVEN AS SURFACE AREA IN THE CT. D.E.P. "LAKE AND POND SURVEY SERIES" No. 11, REV. 1971. THIS AREA (28.1 AC), HOWEVER, SEEMS TO CORRESPOND TO A W.L. HIGHER THAN ELEV. 249' NGVD (MSL) ON THE U.S.G.S. MIDDLETOWN, CT. QUAD. SHEET, WHERE THE LAKE AREA AT ELEV. 249' MSL MEASURES ONLY (±) 16.5 AC: INTERPOLATION BETWEEN THE DEP AREA (AS IF IT WERE AT ELEV. 249) AND THE AREA AT CONTOUR 260' MSL (USGS) IS CONSIDERED TO GIVE A BETTER LAKE AVE. AREA BECAUSE OF THE LARGE SWAMPY LAND ADJACENT TO THE U/S END OF THE LAKE WHICH LIES BELOW ELEV. 250' MSL.

ii) ASSUME NORMAL POOL AT FLOW LINE (ELEV. 249' NGVD)

iii) WATERSHED D.A. = 0.67 sq mi (SEE P. D-1)

iv) PEAK OUTFLOWS (Q_{P_3} & Q'_{P_3})

(DETERMINED ON THE OUTFLOW RATING CURVE P. D-3 BY USING THE APPROX. ROUTING NED-ACE GUIDELINES "SUR-

CHARGE STORAGE ROUTING" ALTERNATE METHOD AND 19" MAX. PROBABLE R.O. IN NEW ENGLAND)

$Q_{P_3} = 1400$ CFS $H_3 = 4.3'$

$Q'_{P_3} = 580$ CFS $H'_3 = 3.6'$

3) SPILLWAY CAPACITY RATIO TO PEAK OUTFLOWS.

SPILLWAY CAPACITY TO:	SURCH.* H (FT)	W.S. ELEV. (FT.-NGVD)	SPILLWAY CAPACITY (CFS)	SPILLWAY CAPACITY AS % OF PEAK OUTFLOWS	
				Q_{P_3} (1400 CFS)	Q'_{P_3} (580 CFS)
LOW POINT	3.2'	252.2	380	27	66
TOP OF DAM**	3.5	252.5	430	31	74
1/2 PMF	3.6	252.6	450	—	78
PMF	4.3	253.3	590	42	—

*SURCHARGE ABOVE SPILLWAY CREST
**DESIGN TOP OF EMBANKMENT, ELEV. 252.5' NGVD

DOOLEY POND DAM

II) DOWNSTREAM FAILURE HAZARD.

1) POTENTIAL IMPACT AREA

THREE OR MORE HOUSES, A SCHOOL, AN APARTMENT BUILDING AND TWO RESTAURANTS ALL WITH FIRST FLOOR ELEVATIONS FROM 5' TO 10' ABOVE THE LONG HILL BROOK STREAMBED AND LOCATED (±) 3500' D/S FROM DOOLEY POND, CONSTITUTE A POTENTIAL IMPACT AREA IN CASE OF FAILURE OF THE DAM.
FURTHER D/S, LONG HILL BROOK DRAINS INTO PAMECHA POND AND CROSSES THE CITY OF MIDDLETOWN JOINING SUMNER BROOK TO ITS CONFLUENCE WITH THE CONNECTICUT RIVER.

2) FAILURE AT DOOLEY POND DAM

ASSUME SURCHARGE TO TOP OF DAM (DESIGN) ELEV. 252.5' NGVD

a) HEIGHT OF DAM*: $H \doteq 23.5'$

b) MID-HEIGHT LENGTH*: $\ell \doteq 250'$

c) BREACH WIDTH (SEE NED-ACE D/S DAM FAILURE GUIDELINES)

$W = 0.4 \times 250 = 100'$ ∴ ASSUME $W_b = \underline{100}'$

d) ASSUMED WATER DEPTH AT TIME OF FAILURE: $Y_o = 23.5'$

e) SPILLWAY DISCHARGE AT TIME OF FAILURE: $Q_s = \underline{430}$ CFS (SEE P. D-5)

*FROM CE FIELD MEASUREMENTS ON 4/11/80 BY HILL & R.S. AND THE CT. BOARD OF FISHERIES AND GAME "REPAIR OF DOOLEY POND DAM" DRAWINGS DATED APRIL, 1966.

f) BREACH OUTFLOW (SEE NED-ACE GUIDELINES):

$$Q_b = \frac{8}{27} W_b \sqrt{g}\, y_o^{3/2} = 19200^{CFS}$$

g) PEAK FAILURE OUTFLOW (Q_{P_1}) TO LONG HILL BROOK

$$Q_{P_1} = Q_{P_2} + Q_b = 17600^{CFS} \quad \text{SAY, } Q_{P_1} = \underline{20000}^{CFS}$$

3) FLOOD DEPTH * IMMEDIATELY D/S FROM DAM:

$$y \cong 0.44\, y_o = 10.3' \quad \text{SAY, } y = \underline{10'}$$

*(FROM THE RETREATING WAVE THEORY APPLIED TO DAM FAILURE)

4) ESTIMATE OF D/S FAILURE CONDITIONS AT POTENTIAL IMPACT AREA:

(SEE NED-ACE GUIDELINES FOR ESTIMATING D/S FAILURE HYDROGRAPHS)

a) THE (±) 3500' LONG REACH OF LONG HILL BROOK FROM THE DAM TO THE POTENTIAL IMPACT AREA IS GENERALLY V-SHAPED IN CROSS SECTION TO A DEPTH OF (±) 10', WITH (±) 5H AND 17H TO 1V SIDE SLOPES. ABOVE 10' DEPTH THE CHANNEL SECTION OPENS TO THE LEFT TO A TOTAL WIDTH OF (±) 1000' BEFORE CONTINUING ON (±) 5H AND 6H TO 1V SIDE SLOPES. THE AVERAGE REACH SLOPE IS (±) 1.7%.

b) RESERVOIR STORAGE AT TIME OF FAILURE:

$$^*S_{MAX} \cong \underline{250}^{AC\text{-}FT} \qquad (\tfrac{1}{2} S \cong 125^{AC\text{-}FT})$$

*STORAGE FROM CT. DEP BATHYMETRIC MAP OF DOOLEY POND WITH GRAPHICAL SCALE (1" = 1" = 368' AND 3' CONTOUR INTERVALS ("LAKE AND POND SURVEY SERIES No. 11, REV. 1971): $S_{MIN} = 141^{AC\text{-}FT}$; $S_{MAX} \cong 244^{AC\text{-}FT}$; SAY, $S_{MAX} = \underline{250}^{AC\text{-}FT}$. ALSO, ACE-U.S. INVENTORY OF DAMS, 1/23/80 p. 20: $S_{MAX} = 246^{AC\text{-}FT}$.

c) APPROXIMATE STAGE AT POTENTIAL IMPACT AREA

$Q_{P_1} = 20000^{CFS} \therefore Y_1^* \cong 11.6'$; $V_1 \cong 124^{ACFT} \leq \frac{S}{2}$ FOR A REACH OF 2000'; $n \cong 0.050$

$\therefore Q_{P_2} \cong 10100^{CFS} \therefore Y_2 = 9.24'$; $V_2 = 43.1^{ACFT} \therefore \bar{V} \cong 83.5^{ACFT} \therefore Q_{P_3} \cong 13300^{CFS}$

$\therefore Y_3 \cong 10.7'$ ($V_3 = 82.8^{ACFT}$ OK)

2nd REACH ($L \cong 1500'$) TO POTENTIAL IMPACT AREA:

$Q_{P_1} \cong 13300^{CFS} \therefore Y_1 \cong 10.7'$; $V_1 = 62.1^{ACFT}$ (REACH 1500' - SAME SECTION)

$\therefore Q_{P_2} = 10000^{CFS} \therefore Y_2 \cong 9.2'$; $V_2 = 32.1^{ACFT} \therefore \bar{V} \cong 47.1^{ACFT} \therefore Q_{P_3} \cong 10800^{CFS}$

$\therefore Y_3 \cong 9.5'$

$\therefore$ REACH OUTFLOW: $Q_{P_3} \cong \underline{11000}^{CFS}$ $Y_3 = \underline{9.5'}$

d) APPROXIMATE STAGE BEFORE FAILURE: $Q_s = \underline{430}^{CFS}$ $Y_s \cong \underline{2.8'}$

e) RAISE IN STAGE AT IMPACT AREA: $\Delta Y \cong \underline{6.7'}$

III) SELECTION OF TEST FLOOD

1) CLASSIFICATION OF DAM ACCORDING TO NED-ACE GUIDELINES:

a) SIZE: *STORAGE (MAX) ≈ 250 ACFT (50 < S < 1000 ACFT)
HEIGHT ≈ 23.5' (H < 25 FT)

*STORAGE: SEE p. D-7 ; HEIGHT : SEE p. D-6

∴ SIZE CLASSIFICATION: SMALL

b) HAZARD POTENTIAL: AS A RESULT OF THE DL FAILURE ANALYSIS AND IN VIEW OF THE IMPACT THAT FAILURE OF DOOLEY POND DAM MAY HAVE ON THE POTENTIAL IMPACT AREA (P. D-6), THE DAM IS CLASSIFIED AS HAVING:

HAZARD CLASSIFICATION: HIGH

2) TEST FLOOD : ½ PMF = 850 CFS

THIS SELECTION IS BASED ON THE RESULTS OF THE PREVIOUS ANALYSIS AND CLASSIFICATION.

DOOLEY POND DAM

IV) SUMMARY

1) TEST FLOOD = ½ PMF ≅ 850 CFS
(PARALLEL COMPUTATIONS HAVE BEEN MADE FOR PMF = 1700 CFS AND ARE ALSO SUMMARIZED BELOW)

2) PERFORMANCE AT PEAK FLOOD CONDITIONS:
a) PEAK INFLOWS: Q_{I_1} = PMF ≅ 1700 CFS Q'_{I_1} = ½ PMF ≅ 850 CFS
b) PEAK OUTFLOWS: Q_{I_3} ≅ 1400 CFS Q'_{I_3} ≅ 580 CFS
c) SPILLWAY CAPACITY: (SEE TABLE P. D-5)
d) PERFORMANCE:
i) AT TEST FLOOD: OVERTOPPED ABOVE LOW PT. (±) 0.4' (MS. EL. 252.6' NGVD)
ii) AT PMF: OVERTOPPED ABOVE LOW PT. (±) 1.1' (MS. EL. 253.3' NGVD)

3) DOWNSTREAM FAILURE CONDITIONS:
a) PEAK FAILURE OUTFLOW: Q_{I_1} ≅ 20000 CFS
b) FLOOD DEPTH IMMEDIATELY D/S FROM DAM: Y_0 ≅ 10'
c) CONDITIONS AT THE INITIAL IMPACT AREA (LONG HILL BROOK):
STAGE BEFORE FAILURE: (Y_S) ≅ 2.8' (Q_S = 430 CFS)
STAGE AFTER FAILURE: (Y_3) ≅ 9.5' (Q_{I_3} = 11000 CFS)
RAISE IN STAGE AFTER FAILURE: ΔY = 6.7'

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

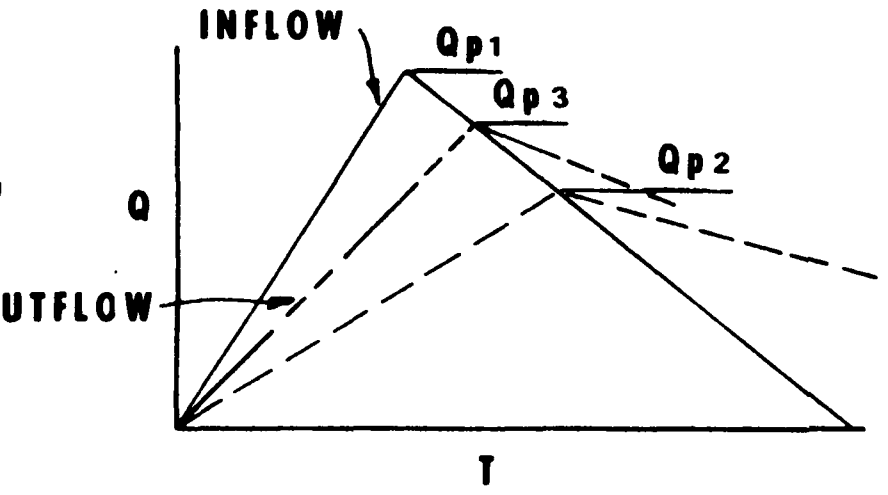
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS
BASED ON TWICE THE
STANDARD PROJECT FLOOD
(Flat and Coastal Areas)

River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1. Pawtuxet River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Hopk.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

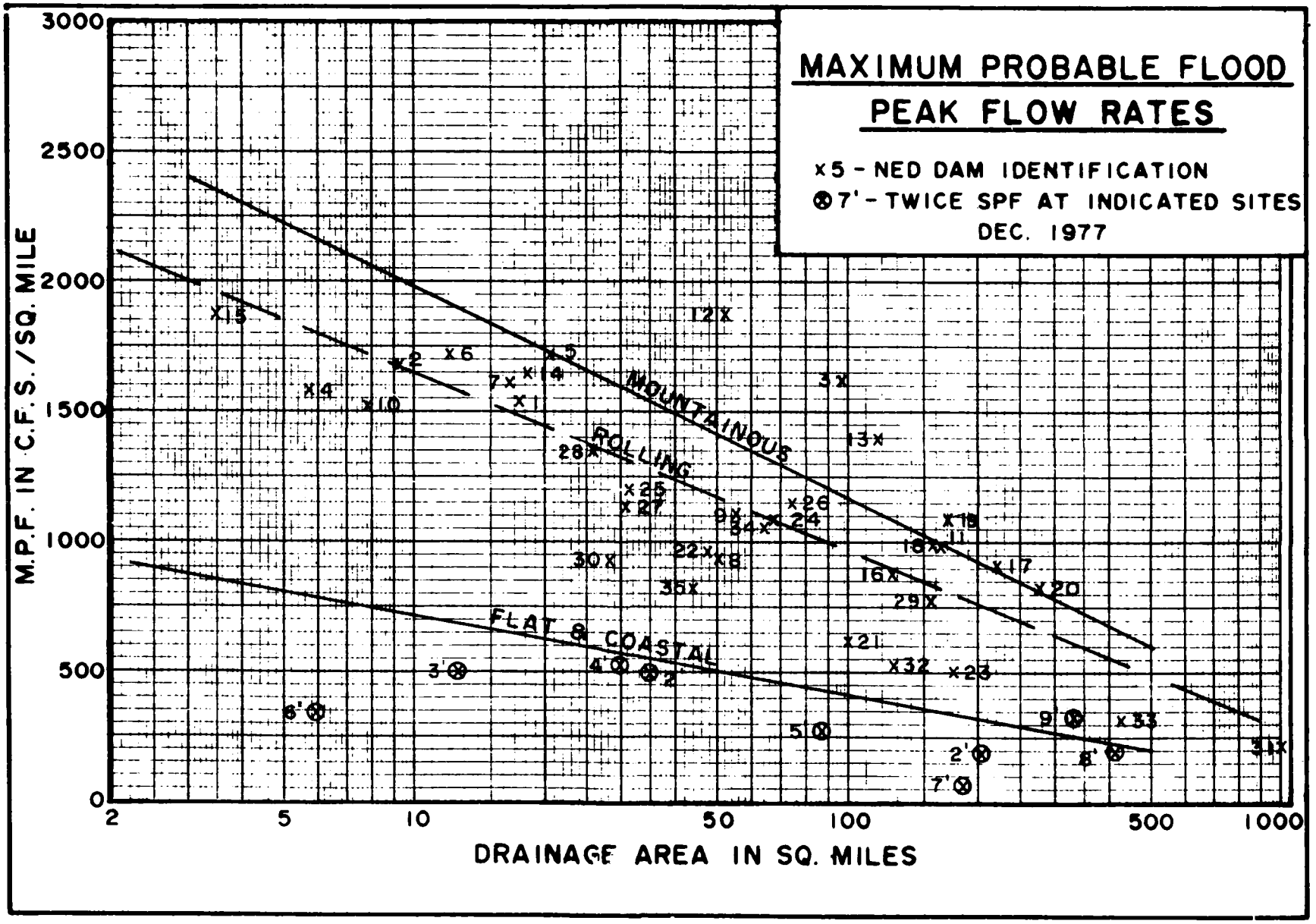
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL
x15
x4
x10
x2
x6
7x
x14
x1
x5
12x
3x
13x
28x
x25
x27
9x
84x
x24
x26
x18
11
18x
x17
x20
16x
29x
30x
22x
x8
36x
x21
x32
x23
x33
31x
3⊗
4⊗
2⊗
6'⊗
5'⊗
9'⊗
2'⊗
8'⊗
7'⊗

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

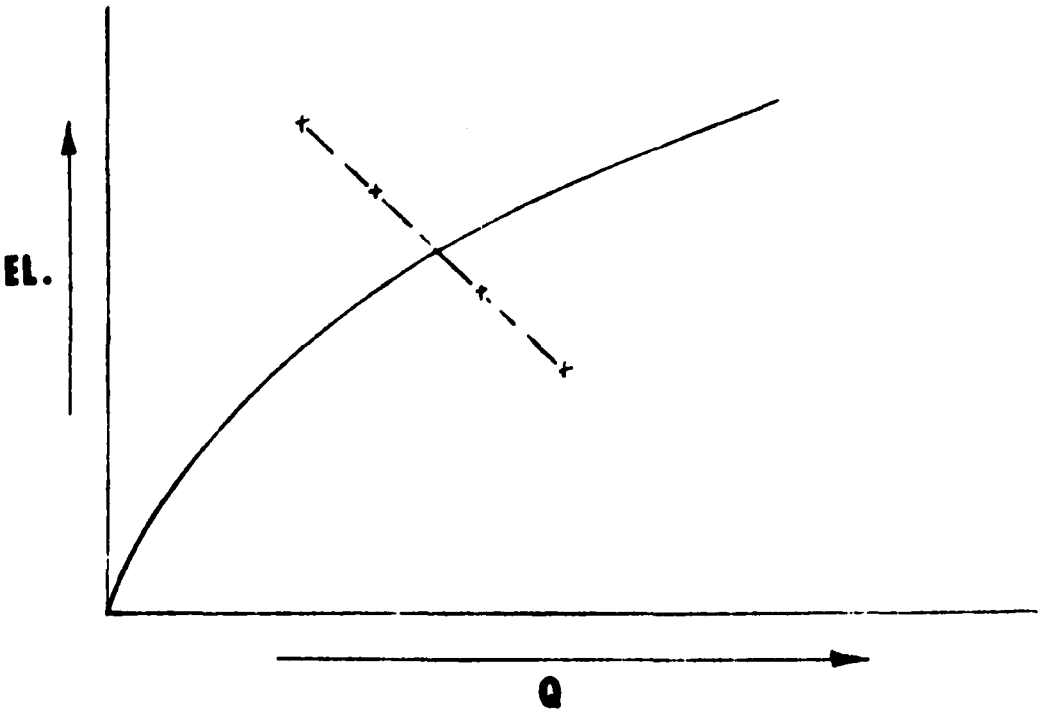
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

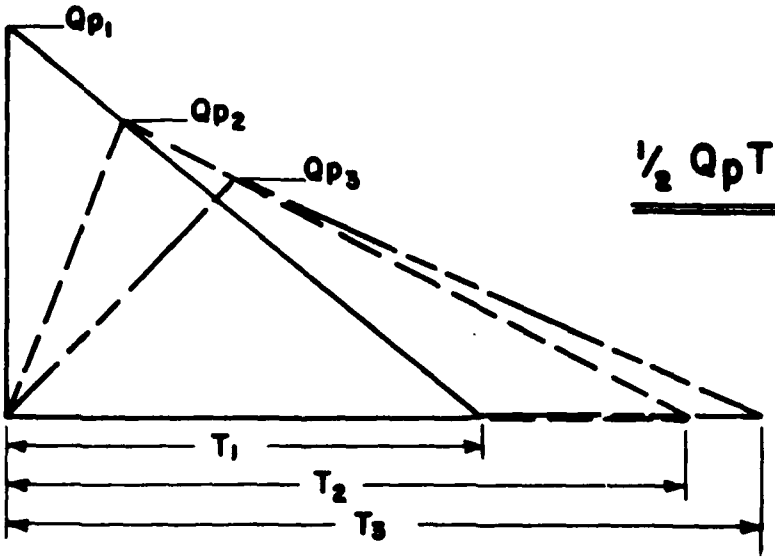
$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19" R.O.

Q_{p2}	STOR	EL.



"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{\frac{3}{2}}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Q_{p_2}(\text{TRIAL}) = Q_{p_1}\left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Q_{p_2} = Q_{p_1}\left(1 - \frac{V_{ave}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

END

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